New Year Message From The Minister For Agriculture And Stock ....

Hon. O. O. MADSEN, M.L.A.

At the beginning of a new year I join with the officers of my Department in extending greetings to all primary producers throughout Queensland.

One cannot wish farmers more than that the seasons should be beneficial and the markets favourable. The rest depends not so much on luck as it does on their own hard work and thoughtful planning. But our Department can help here, for it is our job to provide useful material with which to make the work lighter and more efficient and the planning easier and more effective.

The year has been generally favourable for agricultural and horticultural crops and sheep and cattle areas experienced normal conditions, except in some parts, especially the south-west, where drought prevailed.

Throughout Australia, rural industries thrived to such an extent that an increase of 11 per cent. was recorded in aggregate production for the financial year.

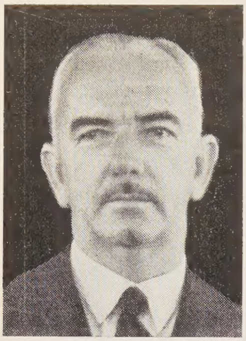
Exports of primary produce were valued at £809m., which was only £3m. lower than in the previous financial year. Prices of wool and sugar declined but earnings from meat and dairy produce showed a welcome rise. The market for canned fruits was restricted.

Once again, a lot of people have co-operated with my Department in helping to carry out work of immeasurable benefit to the producer, and it is my pleasant duty to extend to them our sincere thanks. Without this working together, our officers could not serve the agricultural and animal industries half so well as they do.

We look forward to continuance of the good spirit that leads to this side-by-side endeavour for, as most people know, this is the way many solutions to rural problems are reached.

To all on the land I extend my best wishes for a happy and successful 1960.

Otto Madsen



W. J. S. SLOAN, Director, Division of Plant Industry

Balanced Farming

Balanced farming is a system which gives first-class production, with first-class maintenance of the soil, in a way that pays. A sound soil and water conservation programme is required which co-ordinates the physical, economic and human resources of the farm.

Since conditions vary from farm to farm and from district to district, the most effective combination of practices which fits the situation of each individual farm is needed. To a large degree the onus is on each farmer to acquaint himself of the facts about improved practices and to apply those facts in the most practical manner to his own situation. To do this calls for planning—planning the seasonal operations and planning ahead for the development of the farm.

Important principles which have to be considered in drawing up a balanced farming system can be grouped under three headings: water—soil—storage of fodder.

Water is the most important factor governing farm operations in Queensland; water as soil moisture; water for humans and stock in streams, underground sources and storages.

Of over 2,500,000 acres which are under crops, only about 160,000 acres are irrigated, hence the efficient utilization of rainfall which falls on cultivated land is most important in our farming.

Most of our rainfall comes during the summer months and as you go from south to north the dominance of summer rainfall becomes even more marked. In addition to this, the rainfall is erratic and unreliable. We cannot be sure that we will get spring or early summer storms or that the summer wet season will start on time. All this adds up to the fact that it is very desirable to have the soil in such a condition that it will have a high capacity to absorb rain and retain it.

CARE OF THE SOIL

Continuous cultivation leads to a breakdown of the soil to a powdery state with a decreasing capacity to absorb rain. So the problem is to avoid that as far as possible. How can it be done?

Much good can be accomplished during the period of land preparation—even of powdery soils—by leaving the land with a rough surface for a time so that rain is trapped in a series of small pools to soak into the soil. Furthermore, rotation of crops with pastures will improve the physical condition of the soil and hence its absorptive capacity for rain. This is due to the fact that grass roots have the power to bind soil together in granules.

The use of a pasture phase is a most important part of crop rotation. It has been recognised for a long time in the older farming areas of the world but few farmers have followed this principle systematically in Queensland. Of course, to make economic use of the pasture, it is necessary to introduce the grazing animal. There is much merit in this apart from soil improvement because cropping plus animals can create more stable farm income.

Stubble mulch farming, the system of leaving crop residues on the soil surface while preparing land for the next crop, is worth careful consideration under Queensland conditions. There is ample proof that there is much less runoff of water and better absorption when rain falls on a soil surface covered with crop residues. Crop residues left in such a manner can be a nuisance when working the land and when sowing. But stubble mulching is sound in principle and we should work towards a farming system where we can handle crop residues on the surface of cultivated land without difficulty.

It is one thing to trap rainfall in soil, it is another matter to hold it there. Soil type has a big influence on this. Clay soils have a high capacity to hold water and for that reason the use of soils for cultivation with good clay subsoils is desirable. With the subsoil well wetted by conserved rainfall, crops can draw on the available moisture in the clay and thrive even though seasonal rainfall may be low.

The secret of dry farming is the application of techniques to trap rainfall and the use of clay subsoils to hold it. To get the subsoil sufficiently wet it may be necessary to bare fallow for six months or more before crops are sown.

Weeds use soil moisture which should be reserved for crops; hence their control is important. During the fallow period and when crops are growing, weeds must be held in check.

The whole matter of soil conservation and soil improvement, and diversification of farm operations for those purposes, is one to which every farmer should give close attention.

Land, Labour, Capital

All types of production depend basically on three factors, land, labour and capital. Both labour and capital are variables but the land resources represented on farms are relatively fixed in quantity. It is in the power of the farmer to see that those resources are conserved with vigour and determination.

There are two main problems. First, to see that soil is not washed off the farm, and second, where soil erosion is not a risk, say on level arable land, to ensure that the fertility of the soil, that is, its power to produce crops, is maintained.

The application of soil conservation techniques is of primary consideration. The greatest resistance to soil erosion is provided by vegetable material on the soil surface, either dead in the form of stubble mulch to which I have already referred, or alive in the form of pasture or closely sown crops.

But reliance on this principle alone may not be enough, either because of the slope of the cultivated land, the volume of runoff water you may have to deal with or because you may have already allowed erosion to cause serious damage to the soil. In such cases, a system of mechanical structures in the form of earth banks and channels on the contour, and grassed waterways, may be required in order to control the runoff water.

Indeed the application of a system of mechanical structures may have to be the first step in checking soil erosion but the use of correct farming systems involving proper handling of crop residues and crop rotation, including pasture, grazing crops and so on, should receive increasing attention.

I have previously mentioned crop rotation incorporating a pasture phase as being very valuable from the point of view of improving the condition of soil for better absorption and retention of water. Crop rotation also has an important influence in another direction, in building up soil fertility, particularly in respect of the valuable plant nutrient, nitrogen. This can be achieved by including a leguminous plant-like lucerne or a cover crop like cowpeas in the rotation.

Legumes by virtue of bacteria located in nodules on their roots can extract nitrogen from the air which can later be utilized in building up the nitrogen resources of the soil.

So that crop rotation represents several important principles—improving the condition of the soil, building up soil fertility, and providing for the introduction of farm animals.

STORAGE OF FODDER

The third main part of a balanced farming system which needs emphasis is storage of fodder. The basic principle is a simple one—when fodder is ample, to store it for the periods of the year when rainfall is low and pasturage inadequate. No matter how we look at this question, we cannot get away from the fact that our main rains occur in the summer and we have dry periods every year.

Improved pastures, the use of grazing crops on fallowed land, the increasing acreage under irrigation, can all help, but add them all together and they still do not provide the solution to our seasonal shortages of pasturage, much less to our periodic droughts. We must face up to the problem of our seasonal and erratic rainfall in relation to our stock industries and learn to solve it economically. Storage of fodder is the obvious avenue for vigorous exploration.

Balanced farming principles cannot be applied in the same manner on all farms, but the principles are sound and each farmer has to work out the methods and system best suited to his own situation.

The sugar cane farmer has developed a successful system without requiring grazing animals. He can afford to use liberally plant nutrients as fertilizers. The same applies for the most part to fruit and vegetable growers and to tobacco farmers.

A huge area of potential farming land in Queensland lies in the 40-in.-and-below annual rainfall belt. It is in that area particularly where the complete application of all the principles of balanced farming must find full expression if we are to achieve first class production with first class maintenance of the soil in a way that pays.

Calf Birth Weights

Information has been requested on the birth weights of normal calves.

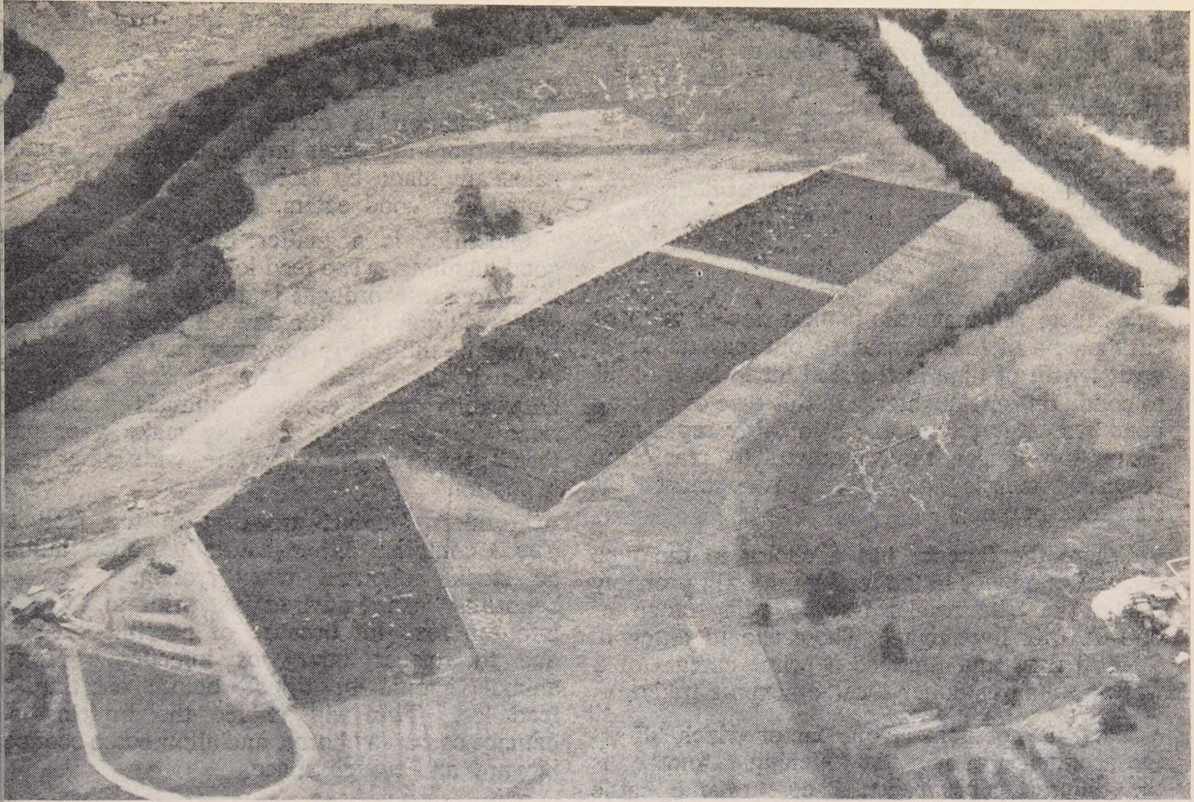
Differences occur both within breeds and according to breed, but the following weight ranges will account for the largest group within each breed:

Jersey : 50-61 lb.
Guernsey : 65-71 lb.
Ayrshire : 71-78 lb.
Friesian : 93-99 lb.
Hereford : 68-72 lb.

In the case of the dairy breeds the lower weight is the average for females and the higher weight the average for males.

Twins and triplets are lighter than calves of the same breed born singly.

If cows are on a very low plane of nutrition during the second half of pregnancy, birth weights could be considerably below the figures given.



e 1: An 8-Pen Feed Lot Covering 6 Acres and Carrying 1,300 to 1,500 Head of Cattle. This lot feeding enterprise is conducted at Tingalpa near Brisbane by Swift Australia (Pty.) Ltd.

Lot Feeding Of Beef Cattle

By W. F. MAWSON and D. N. SUTHERLAND, Cattle Husbandry Branch.

In view of the changing emphasis brought about by higher prices for beef, it is timely to point out some principles involved in feed-lot feeding. The volume of locally-obtained knowledge is being increased steadily. This article aims to assist those producers who are contemplating a venture of this nature. At the same time it should be recognized that feed-lot fattening is in the pioneering stage in Queensland at present.

The relationship between grain prices and beef ices has never been more favourable for the oduction of grainfed beef cattle. There is also likelihood of a surplus of sugar cane. In dition, interest is being shown in the possibility (*a*) making better use of grazing crops by eans of lot feeding and (*b*) the use of cheap by-products (peanut straw, cottonseed hulls, pineapple pulp) as a basis for fattening rations.

The Type of Cattle

Young stock, from weaners to 18 months of age at the beginning of feeding, are likely to yield the most economic return when high quality feed is used. This is true where efficiency of conversion of good quality feed to beef is the dominant factor. The position may be different where large quantities of cheap by-products form the basis of a ration. These feeds are of lower quality and are unsuitable as a major component of feed lot rations for young stock. Such feeds can be better utilized by older animals, say 3-year-old stores. Although the efficiency of gain may be lower, total gain is likely to be higher.

Weaners will make the highest rate of gain for each pound of food consumed but may require a great length of time in the feed lot to be brought to condition for slaughter. In this type of animal, bone growth is proceeding at a fairly rapid rate, hence the longer time required to reach the required muscle and fat development for slaughter purposes.

Where the fattener has a choice in the type of animal to place in the feed lot, he will probably obtain the best results from yearling stock of 600–700 lb. liveweight. These should fatten in 90–100 days and produce a prime carcass of a weight suited to either local or export trade.

Efficiency of gain is one factor which affects the economics of feed lot fattening. Another is the difference between the cost of the cattle before feeding and the value of the cattle when fattened. Under some circumstances, for example, drought conditions, it is possible to buy 3-year-old bullocks at a comparatively cheap rate. These animals will be backward stores but many of them are capable of making high weight gains. These big-framed animals will handle a greater proportion of the lower quality feeds which are plentiful and cheap on occasions.

It should be recognised that beef from this type of carcass will be inferior to the younger carcass because of less "marbling" and an increased amount of external fat.

To sum up:

- Weaners utilize good quality feed most efficiently but may take a longer time to develop into slaughter animals.
- Yearlings are comparatively efficient and produce a carcass of prime quality.
- Older, big-framed cattle are sometimes available cheaply. They can use a greater proportion of low quality feed and are capable of good weight gains. Carcass quality will be below the standard of th yearlings.

Other Important Factors

In addition to consideration of the age o stock, there are other important factors. Highes gains are made by stock which are quiet, contented and good eaters.

Quietness is a matter of temperament an good handling. The feed lot is a strange environment to cattle brought in for fattening but mos cattle will quickly settle down if properly handled It may be difficult to recognise any bad-tempere types at the outset. After a week or so an noticeably temperamental animals should b removed, since they not only make poor gain themselves, but also interfere with other stoc in the lot.

Hornless animals are best in the feed lot These comprise either naturally polled animal or stock dehorned when young. However dehorning is not advised just prior to the entr into the feed lot because of possible set-back due to further injury or infection. Horne animals should be tipped before entering th feed lot. This will reduce the bruising an damage caused by horns, and allow some econom in yard and trough space.

The condition of cattle when entering th feed lot is probably the most important facto determining the length of time required befor turn-off. This affects the number of animal turned off each year. The total number turne off each year and the profit margin on eac one are important factors influencing th profitability of the enterprise. Compared wit backward stores, cattle in forward condition wi be turned off in a shorter time but on the othe hand the margin of profit may be narrower. Thi can be illustrated by using hypothetical figures.

Assume that a feeding lot has a capacity o 1,000 head. Backward stores, bought at £3 a head, are turned off at 150 days and averag £58 a head. Forward stores can be bough for £35 a head and turned off in about 70 day at an average price of £50 a head. Feed o good quality is used and the total annual expense for feed, labour, and other costs are £62,500.

It should be borne in mind that feeding fo high rates of gain is generally the most economi procedure. The maintenance feed requiremen of animals is relatively constant and is practically the same whether an animal gains 1 lb a day or 3 lb. a day. Thus, more productive use is made of feed when it is used in a way which produces a high rate of gain over a short period rather than a low rate of gain over a longer period. There would seem to be no point in feed-lot feeding for a low rate of gain.

A comparison shows:

Table 1

—	Backward Stores		Forward Stores	
No. turned off per year	2,500		5,000	
	£	£	£	£
Sale Price	..	145,000	..	250,000
Less—				
Purchase Price	75,000		175,000	
Feed, Labour and Other Expenses ..	62,500	137,500	62,500	237,500
Net Profit ..		£7,500		£12,500
Profit per Head ..	£3		£2 10s.	

Some form of hard-surfacing or timber platform is likely to be needed near the trough. This should extend for a distance of about 12 ft. away from the trough to avoid any bogging immediately behind the animals as they stand eating at the trough.

A plentiful water supply in suitable troughs should be always available to the stock. Shade is desirable, especially in summer.

The activity of the animals should be restricted to a reasonable extent. For example, the running of cattle on pasture in conjunction with feed lot fattening appears to have serious disadvantages in that the extra energy used in gathering pasture tends to offset the cheapness of pasture feeding.

Consideration should also be given to market requirements and seasonal variation in demand. Generally, the feed lot produces high quality beef which should command the premium price.

Table 2

Recommended Daily Nutrient Allowances for Beef Cattle
(Based on Air-dry Feed Containing 90 Per Cent. D. M.)

Body Weight	Expected Daily Gain	Daily Allowances per Animal						
		Total Feed		Digestible Protein	Total Digestible Nutrients	Calcium	Phosphorus	Carotene
		Percentage of Live-Weight	per Animal					
lb.	lb.		lb.	lb.	lb.	grams	grams	mg.
Fattening Calves Finished as Young Yearlings								
400	Average for Period—2·0 lb. daily	3·0	12	1·1	8·0	20	15	24
500		2·8	14	1·2	9·5	20	16	30
600		2·7	16	1·3	11·0	20	17	36
700		2·6	18	1·4	12·0	20	18	42
800		2·5	20	1·5	13·5	20	18	48
900		2·3	21	1·5	14·5	20	18	54
Fattening Yearling Cattle								
600	Average for Period—2·2 lb. daily	3·0	18	1·3	11·5	20	17	36
700		3·0	21	1·4	13·5	20	18	42
800		2·8	22	1·5	14·0	20	19	48
900		2·7	24	1·6	15·5	20	20	54
1000		2·6	26	1·7	17·0	20	20	60
1100		2·4	27	1·7	17·5	20	20	66
Fattening Two-Year-Old Cattle								
800	Average for Period—2·4 lb. daily	3·0	24	1·5	15·0	20	18	48
900		2·9	26	1·6	16·0	20	20	54
1000		2·7	27	1·7	17·0	20	20	60
1100		2·6	29	1·8	18·0	20	20	66
1200		2·4	29	1·8	18·0	20	20	72

TABLE 3

RECOMMENDED NUTRIENT CONTENT OF RATIONS*
(N.B. DRY MATTER BASIS)

Body Weight	Expected Daily Gain	Allowance as per cent. of Ration or Amount per Pound of Feed						
		Daily Feed		D.P.	T.D.N.	Calcium	Phosphorus	Carotene
		Percentage of Live-Weight	per Animal					
lb.	lb.		lb.	Per cent.	Per cent.	Per cent.	Per cent.	mg./lb.
		Fattening Calves Finished as Young Yearlings						
400	Average for Period—2·0 lb. daily	2·8	11·0	10·0	74	0·41	0·31	2·2
500		2·5	12·5	9·6	75	0·34	0·28	2·3
600		2·3	14·0	9·0	75	0·31	0·26	2·4
700		2·3	16·0	8·7	75	0·28	0·24	2·5
800		2·2	18·0	8·3	75	0·24	0·22	2·7
900		2·1	19·0	8·0	75	0·23	0·21	2·9
		Fattening Yearling Cattle						
600	Average for Period—2·2 lb. daily	2·7	16·0	8·0	72	0·28	0·23	2·2
700		2·7	19·0	7·8	72	0·23	0·21	2·2
800		2·5	20·0	7·6	72	0·22	0·21	2·4
900		2·4	22·0	7·5	72	0·20	0·20	2·4
1000		2·3	23·0	7·3	72	0·19	0·19	2·5
1100		2·2	24·0	7·0	72	0·18	0·18	2·7
		Fattening Two-Year-Old Cattle						
800	Average for Period—2·4 lb. daily	2·7	22·0	7·0	69	0·20	0·20	2·2
900		2·6	23·0	7·0	69	0·19	0·19	2·3
1000		2·4	24·0	7·0	69	0·18	0·18	2·4
1100		2·4	26·0	7·0	69	0·17	0·17	2·5
1200		2·2	26·0	7·0	69	0·17	0·17	2·7

The nutrient content of rations is given on a " Dry Matter Basis " since analyses of foodstuffs in Queensland are given on a dry matter basis.

* Adapted from " Recommended Nutrient Allowances for Beef Cattle," 1950.

In addition, it can be available at a time when the seasonal price trend is at its peak. The fattener who produces a carcass of the right size and degree of fatness should have no difficulty in finding a ready market.

Yard Size

Yards should be located on high ground with a gentle slope away from the feeding area. An allowance of 80–100 sq. ft. to each animal can be used as a guide to required yard space. Stock numbers should be limited to about 150 head to each yard.

Troughs placed around the perimeter of the lot are more convenient than troughs inside the lot, whether fixed or portable. Wooden troughs should not be in contact with the ground because of rapid deterioration. Troughs with sides 18 in. high and 2 ft. wide raised 6 in. above ground level should provide enough capacity to avoid wastage. Lower sides may be needed for young animals. A 4 in. x 2 in. buffer rail should be bolted above the inside edge of the trough. Stock then place their heads through the opening beneath the buffer rail and above the top edge of the trough. Two feet of trough length is the space allowed to each animal for troughs used on the perimeter of yards.

Animal Requirements

The following tables of feed allowances for fattening young cattle are based on recommendations of the National Research Council, U.S.A. (Recommended Nutrient Allowances for Beef Cattle (1950) No. IV.). The allowances are expressed in the following terms:

Air-dry feed containing 90 per cent. dry matter, which is self-explanatory. Most air-dried feed contains about 90 per cent. dry matter.

TABLE 4

AVERAGE COMPOSITION AND DIGESTIBLE NUTRIENTS OF VARIOUS FEEDS*

Feedstuff	D.M.	D.P.	T.D.N.	Calcium		Phosphorus		Carotene
	Per cent.	Per cent.	Per cent.	Per cent.	g./lb.	Per cent.	g./lb.	mg./lb.
Hays—								
Oaten Wheaten Sudan grass Jap. millet	90	3·0	50	0·20	0·9	0·20	0·9	4–8
Lucerne	90	10·0	50	1·20	5·4	0·20	0·9	9–14
Cowpea and Field pea	90	10·0	50	1·20	5·4	0·30	1·4	
Soybean	88	10·0	50	1·20	5·4	0·30	1·4	3–13
Straws—								
Oat Barley Wheat	90	0·5	40	0·20	0·9	0·10	0·45	–
Peanut (depending on quality)	90	2·0–5·0	50	†	..	..	..	–
Green Fodders—								
Grazing Oats Wheat, Millet Sudan grass in growing stage	25	2·0	14	0·08	0·4	0·06	0·3	15–40
Lucerne	25	3·5	14	0·35	1·6	0·07	0·3	25–40
Cowpea or Field pea	20	2·0	12	0·25	1·1	0·05	0·2	15–40
Sugar cane	25	0·6–1·5	15	..	..	0·04	0·18	–
Silages—								
Green fodder or silage from summer crops	25–30	1·2	18	0·08	0·4	0·08	0·4	2–10
Green fodder or silage from winter crops cut at flowering	25–30	1·5	17	0·08	0·4	0·08	0·4	4–8
Grains—								
Maize	90	8	80	0·01	0·05	0·30	1·4	Yellow maize 1·2
Grain Sorghum	90	8	80	0·03	0·1	0·30	1·4	White maize 0·01–0·2
Wheat	90	8	78	0·04	0·2	0·40	1·8	
Barley	90	7	77	0·05	0·2	0·35	1·6	
Oats	90	8	72	0·06	0·3	0·20	0·9	
Grain By-products—								
Wheat bran	90	11	63	0·09	0·40	1·00	4·5	1·2
Wheat pollard	90	11	73	0·09	0·40	0·65	3·0	–
Oat bran	90	4	52	0·07	0·30	0·45	2·0	–
Protein Rich Concentrates—								
Meat and Bone meal (Quality dependent on proportion of bone)	90	30–40	65–70	8·25	37·00	3·75	17·0	–
Peanut meal	90	37	80	0·15	0·70	0·60	2·7	(nil if obtained by solvent process) 0·1
Cottonseed meal (decorticated)	90	33	75	0·20	0·90	1·20	5·4	0·1
Linseed meal	90	26	75	0·40	1·80	0·75	3·4	(nil if obtained by solvent process) 0·1
Maize gluten	90	21	78	0·10	0·45	0·70	3·2	3·8
Coconut meal	90	17	80	0·30	1·40	0·65	3·0	–
Soybean seed	90	34	90	0·25	1·10	0·59	2·7	0·1
Urea (46% N.)	90	equivalent to 260	–	–	–	–	–	–

† Insufficient data.

Feedstuff	D.M.	D.P.	T.D.N.	Calcium		Phosphorus		Carotene
	Per cent.	Per cent.	Per cent.	Per cent.	g./lb.	Per cent.	g./lb.	mg./lb.
Miscellaneous—								
Cottonseed hulls . .	90	. .	44	0·13	0·59	0·06	0·27	–
Corn cobs (ground) . .	90	. .	46	0·11	0·50	0·04	0·18	–
Corn stalks, shanks and tassels (dried). . . .	83	0·8	41	0·32	1·48	0·23	1·00	–
Peanut hulls	92	1·6	19	0·25	1·10	0·06	0·27	–
Pineapple pulp	15	0·13	10	. .	. .	. .	. .	3·6
Molasses	75	–	60	1·00	4·5	0·89	4·00	–
Cow's whole milk (3·9 % Butter fat)	13	3·2	18	0·12	0·5	0·09	0·40	0·4
Skim milk	9·5	3·4	8·7	0·13	0·59	0·10	0·45	–

* These data have been compiled mainly from the following sources :—
Morrison, F. B., " Feeds and Feeding " 22nd edition ;
Schneider, B. H., " Feeds of the World " ;
National Research Council "Nutrient Requirements of Beef Cattle No. IV., 1958" ;
Analyses by Agricultural Chemist and Bio-chemist of Queensland Department of Agriculture and Stock.

Digestible Protein in Pounds: Digestible protein is abbreviated to D.P., and the D.P. content of a feed is expressed as a percentage of the dry matter in the feed unless otherwise specified.

Total Digestible Nutrients in Pounds: The abbreviation is T.D.N. and is a measure of the gross energy value of a feedstuff. T.D.N. are expressed as a percentage of the dry matter in the feed, unless otherwise specified.

Calcium (*Ca*) *or Lime* is a mineral expressed in grams or as a percentage of the dry matter. Ca comprises approximately five-sevenths of CaO (quicklime).

Phosphorus (*P*) is a mineral, expressed similarly to calcium. P comprises approximately three-sevenths of P_2O_5 (phosphoric acid).

Carotene is the precursor of vitamin A and is expressed as mg. or mg. per pound of feed.

These represent the components which require consideration in making up a ration. For practical purposes all other requirements will normally be contained within adequate quantities of the components listed.

It should be recognised that the given compositions of feeds are averages only. Considerable variation either way is likely to be found. In plant material, the protein and mineral content, in particular, are highest when the plant is growing. The protein content falls steeply after flowering and the phosphorus content is concentrated in the seed. The carotene is contained in the green parts of the plant and diminishes when material is stored. An example from the table will illustrate these points, using oats and converting the figures to a dry matter basis.

TABLE 5

—	D.P.	Phosphorus	Carotene
	Per cent.	g./lb.	mg./lb.
Oats in growing stage	8·0	1·2	60–160
Oaten hay	3·3	1·0	4–8
Oaten straw. . . .	0·55	0·50	Nil

Some variation in the composition of different varieties of plants is found and, in addition to stage of growth, other causes of variation are soil fertility and fertilizer application. Hay quality is determined by the quality of the plant, the stage of cutting, the method of making and weather conditions during the making process.

In the case of waste products such as peanut hulls, peanut straw and maize stalks, a proportion of kernels or grain will be present. Caution is therefore required in compounding rations containing this type of product owing to the variation in composition of different lots.

Grains should be coarsely ground, crushed or rolled before feeding to ensure a high rate of digestibility. Lucerne hay can be fed as hay or chaffed (½ in.–1 in. cut) or roughly milled, according to convenience. Coarser hays, such as sudan grass, should preferably be chaffed or milled.

The various components of a ration should be thoroughly mixed before being offered to the stock.

All feed should be free from mould, decomposed material or foreign matter. Particular precautions are necessary against pieces of wire or nails and poison baits which may have been set for rodents. Rejected feed should be removed from the feed trough.

The decision whether to provide salt is one for personal choice. If included in the total ration, ½ lb. coarse salt to 100 lb. feed (90 per cent. D.M.) is ample. An alternative method is to provide salt blocks in the feed trough or separate trough.

Compounding Rations

In addition to consideration of the class of animals, their appetite and T.D.N. limits, and the nutritive value of feedstuffs, other important practical aspects are the minimum and maximum quantities of any one type of feed and the minimum and maximum roughage intake of animals.

Nutrient Requirements of Beef Cattle Number IV. (1958) states among other things that "the minimum requirement for roughage is 0·5 to 0·8 lb. for each 100 lb. liveweight in fattening cattle. Bloat and digestive disorders are likely to occur if cattle do not receive this quantity when fully fed on grain.

"Feed intake is limited (1) by the bulk-handling capacity of the intestinal tract and (2) by the daily T.D.N. intake of cattle. Concentrate-to-roughage ratios falling between the range of 30:70 to 70:30 have been shown experimentally to be satisfactory in promoting liveweight gains in growing and fattening cattle. Sometimes as much as 80 per cent. concentrates are included in fattening rations."

In grain growing districts in Queensland, the aim will be to use the maximum quantities of grain, since it will be the cheaper commodity. At other localities, the objective may be to utilize as much as possible of low quality by-products or surplus plant material.

Limited local experience to date indicates that the American feeding standards quoted can be used with a reasonable degree of confidence. However, it is essential that more information be obtained on feed intake and rates of gain under our conditions. The use of cattle weighing scales is necessary in this respect. Further, the weighing of stock at regular intervals to record the rate of gain is essential for checking on rations, adjusting rations and in sorting out the occasional animal which just doesn't respond to feed lot conditions. Such stock are "wasters" and should be removed for slaughter.

Since the margin for profit may be small it it necessary that a strict and continuing check be kept on all aspects of the enterprise. Scales are thus a necessary item of equipment.

The following is an example of a suitable ration. The animals are yearlings weighing 600 lb. and fed for a high rate of gain.

The daily requirement is 18 lb. air-dried feed, 1·3 lb. digestible protein, 11·5 lb. T.D.N., 20 g. calcium, 17 g. phosphorus and 36 mg. carotene.

Grain sorghum (D.P. 8; T.D.N. 80) and lucerne hay (D.P. 10; T.D.N. 50) are available.

TABLE 6

—	Feed	D.P.	T.D.N.	Calcium	Phosphorus	Carotene
	lb.	lb.	lb.	g.	g.	mg.
Crushed grain sorghum . .	12	0·96	9·6	1·2	16·8	0·12
Lucerne hay	6	0·60	3·0	32·4	5·4	60·0
Totals . .	18	1·56	12·6	33·6	22·2	60·12

This ration is ample in every respect and above-average gains could be expected.

When maximum use is to be made of grain and it comprises 80 per cent. of the ration, the figures are:—

TABLE 7

—	Feed	D.P.	T.D.N.	Calcium	Phosphorus	Carotene
	lb.	lb.	lb.	g.	g.	mg.
Grain sorghum . .	14·5	1·16	11·6	1·5	20·3	0·15
Lucerne hay	3·5	0·35	1·75	18·9	4·9	35·0
Totals . .	18·0	1·51	13·25	20·4	25·2	35·15

This ration is generous in T.D.N. but is only just adequate in calcium and carotene. Since the lucerne hay is the principal source of these components, it would necessarily need to be of good quality when used in such a ration.

Only experienced feeders should attempt a mixture incorporating such a high proportion of grain.

Getting Animals on to Feed

Sudden changes in the composition of a ration should be avoided. Such changes can result in digestive upsets with consequent loss of weight and loss of appetite.

When stock are brought in to the feed lot they should be brought on to full rations in stages. For the first few days they should be offered hay only—medium quality lucerne hay being most suitable for this purpose. As the stock settle down, the hay is gradually replaced by a quantity of the standard ration. Under normal conditions stock should be safely on full feed in about two weeks from entering the feed lot.

In the matter of feeding for best results, there is no substitute for the observation and interest of the feeder. He should always keep a close watch on stock for any sign of digestive upset and remove the cause at once.

Figures from a Local Trial

The following information has been obtained in a feed lot project and gives an indication of the relative feed consumption and liveweight gains which are being obtained.

Type of animal	Yearling Hereford steers
Initial weight	573 lb.
Final weight	842 lb.
Gain	269 (93 days)
Average gain/head/day ..	2·9 lb.
Average food consumption per animal daily	12.8 lb. crushed barley 6·5 lb. lucerne hay
Lb. feed per lb. live weight gain	4½ lb. grain 2¼ lb. hay
Lb. feed per lb. carcass gain (estimated)	7½ lb. grain 3¾ lb. hay
Feed cost	Barley—£18 13s.—ton Lucerne hay—£6
Feed cost per 100 lb. estimated carcass gain	£7 3s. 3d.

This ration consisted of grain 2 parts and lucerne hay 1 part. Based on the quantities of grain and hay used and the weight gain obtained, the following table gives the *feed cost* of producing 100 lb. of carcass weight at varying feed prices:

TABLE 8

FEED COST OF PRODUCING 100 LB. CARCASS BEEF IN SHILLINGS AND PENCE WHEN FEED COSTS ARE—

Grain Cost per Ton	Lucerne Hay Cost per Ton			
	£5	£10	£15	£20
	s. d.	*s. d.*	*s. d.*	*s. d.*
£5	49 8	66 5	83 1	99 10
£10	82 7	99 4	116 0	132 9
£15	115 6	132 3	148 11	165 8
£20	148 5	165 2	181 10	198 7

Two examples are given of the ways in which the tables can be used. If feed is bought, it can be used to read off what the feed will cost in terms of 100 lb. carcass gain. For example, if grain costs £15 a ton and hay £10 a ton, the cost is 132s. 3d. per 100 lb. carcass gain.

On the other hand, if a producer considers he can afford to spend 120s. per 100 lb. carcass gain on the cost of feedstuff he can read off the prices per ton of feed which will keep within that limit.

Fatteners require an accurate knowledge of when stock are fit for slaughter. It is wise to inspect carcasses of stock sent for slaughter in order to gauge when animals are "finished." As animals become fat, more feed is required for each pound of weight gain. Thus feeding beyond the required degree of finish is wasteful.

Profit and Loss Factors

The possible avenues of income from feed lot fattening are:

(1) An increase in weight of animals.

(2) An increase in value per 100 lb. carcass weight.

(3) Sideline income from pigs and the sale of farmyard manure.

(4) In the long term, an advantage in the preservation of farm fertility.

The items of cost in addition to the stock, are:

(1) Feed costs.

(2) Labour costs.

(3) Running costs of machinery.

(4) Veterinary fees.

(5) Repairs to buildings, plant and equipment.

(6) Depreciation on buildings, plant and equipment.

(7) Interest on capital investment.

(8) In a large feed-lot in the metropolitan area, rental of the land may be considerable.

In the early stages of feed lot fattening, it is likely to be a sideline or joint enterprise with grain growing and perhaps cattle raising. Buildings, tractors and equipment, in addition to labour already available on the property, may be utilized in the lot feeding project and thus tend to increase the overall efficiency of property operations.

How Milk And Cream Transport Is Organised In Queensland

By E. B. Rice, Director of Dairying

Queensland's system of controlled road transport of milk and cream from farms to dairy factories is described.

The Queensland system, which is unique in any country, is implemented by statutory power under certain provisions of the Dairy Produce Act. The objectives of the legislation are to avoid uneconomic competition by factories for suppliers, to assist quality improvement by ensuring that generally supplies are consigned to the closest factory, and to discourage improper grading by factories as a means of attracting supplies from farms which are geographically in the territory of another factory.

Competition between factories for cream supplies in the early 1930's resulted in instances where farmers who lived farther away from a factory were paying lower cartage costs than nearer suppliers. A malpractice had also become ntroduced in the industry whereby some factories subsidized cartage costs of supplies which were geographically in the territory of a neighbouring factory.

In 1934, a section was inserted in the Dairy Produce Acts to prohibit a factory from subsidizing any part of the cost of cartage of milk or cream.

Then in 1935, the Minister for Agriculture and Stock convened a conference of representatives of dairy industry organizations to consider the desirability of legislating for control of the transport of cream to butter factories. The conference passed a resolution affirming the principle of dairy factory associations being given legal authority to control the transport of cream along the roadways. A subcommittee comprising five factory representatives and one Government officer was appointed to devise ways and means of putting this principle into operation.

As a consequence of the subcommittee's report, the Dairy Produce Act was amended in 1935 to provide for the organized control of transport of cream supplies to butter factories by the gazettal of cream routes and the licensing of cream carriers.

Statutory control of transport from farms was at first limited to cream supplies for butter factories, but in 1938 the Act was further amended to extend the system of control to milk supplies for factories.

Essentials of the System

The essential features of the legislation provide for roads, or portions of roads, to be included in milk or cream routes which are published in the *Government Gazette*. Factories are empowered to call for and accept tenders for the cartage of milk or cream on these routes. Subject to the carrier's equipment complying with the requirements under the Act as regards construction and covering, the Minister may issue a licence if he approves of the terms and conditions of an agreement entered into between the carrier and the factory.

There is no obligation on a factory to apply for the gazettal of milk or cream routes. However, if it does not, carriers on notified routes to a neighbouring factory could not be prevented from encroaching in its territory to take supplies to that factory, but carriers to the first-mentioned factory could not travel on the routes notified to the neighbouring factory.

A farmer is not prevented from conveying the milk or cream produced on his own farm to a factory along any roads which are on a notified milk or cream route, but he cannot carry the milk or cream of any other person. This may appear to be arbitrary, but a regular and satisfactory service can only be provided by a carrier if he is protected against farmers conveying their neighbour's produce to a factory. A committee is appointed to assist in the administration of the system.

Notification of Routes

Notified routes are of two kinds—cream routes and milk routes—and these must not be confused. Notification of cream routes is authorised by section 16B of the Dairy Produce Acts and of milk routes by section 16C. The provisions of each section are identical, excepting that the word "cream" is used in the former and "milk" in the latter.

It should be made clear that milk may be picked up by other than the licensed cream carrier on a notified cream route, or cream by other than the licensed milk carrier on a notified milk route. If a factory receives milk and cream from suppliers on any route, it would, therefore, require to have such route notified separately as a milk route and a cream route.

The Minister may, on the recommendation of a factory owner, or of the transport committee, notify any roads or portion of a road as a cream or milk route. He may also refuse to accept such recommendation or accept only a part.

Routes may be notified either specifically or generally. By specifically is meant the cream or milk picked up must be carried to the factory specified. When a route is notified generally it is notified to a railway station or loading point and from there the produce can be forwarded to any factory which the dairy farmer desires. Briefly, as a general guide, if cream is not delivered direct to a factory by the carrier the route is notified generally and if delivered direct to a factory that factory is specified in the notice.

Carrier's Agreement and Licence

Tenders must be called by a factory owner before entering into an agreement with a carrier for the cartage of milk or cream on a notified route and the agreement is limited to a maximum period of five years. Thus, it cannot be renewed without the necessity for tenders having to be invited. The object of the limitation of the term of the agreement is to eliminate a fictitious good-will from the sale of a milk or cream carrying business.

The regulation does not specify the manner in which tenders are to be called, but generally dairy associations advertise in a newspaper circulating in the district. When calling tenders, an association usually inserts a clause that the lowest o any tender may not necessarily be accepted. This ensures that it is not obliged to engage th lowest tenderer if it feels he is not capable o giving satisfactory or continuous service.

The price payable by the farmer for the cartag of his produce to the factory is naturally of som concern to him. The interest of both the suppliers and the previous contractor can be safeguarded if it appears that a tenderer submittin a somewhat lower tender price is, in the opinio of the factory owner, not likely to provide a satisfactory service or be acceptable to the farmers o the route. As there are often local factor involved which require consideration by th factory board of directors in the light of its ow knowledge of local conditions, they should b in the best position to decide on which tende should be accepted.

In general practice, if there is likely to be an doubt about the satisfaction of the farmers o a route with the tenderer, or conditions of th tender, the matter is usually referred by th association to the suppliers on the route. A meeting is convened in a convenient place in order to obtain their views for guidance on the decision to be made by the Association. Before acceptance of a tender, some associations confer with a small committee (say three) appointed by farmers on the route.

The matter of whether the cartage is to be on the basis of a flat rate per gallon irrespective of distance of farms from factories, or variable rates according to distances of the farms from the factories, is one for the Association to decide before calling tenders.

It is necessary for Ministerial approval to be obtained before the issue by the factory owner of a licence to a carrier and the licence is countersigned by the Minister. Associations therefore have to submit the agreement to the Department for approval. Until a licence is issued, the agreement has not the force of law, and the power for the licence to be countersigned by the Minister gives him the right to determine whether the agreement can be approved and a licence issued.

Carrier's Obligations

The obligations of a carrier are set out in a form of agreement which is entered into between the carrier and the factory owner. He is required to pick up at the contracted price all milk or cream of a supplier on or adjacent to the notified milk or cream route, as the case may be, for which he is licensed, and return the empty cans from the factory to the point at which he loaded them when full. Upon obtaining an order in writing from the farmer and handing it to the factory owner, the latter is empowered to deduct cartage costs from the supplier's monthly pay cheque for milk or cream supplied to the factory.

The number of deliveries of cream to be made weekly is prescribed in the contract, and the factory owner is empowered to state the time of day when the delivery is to be made at the factory.

The vehicle used by the carrier must comply with the provisions of the Dairy Produce Acts as regards construction, cleanliness and protection of the quality of milk or cream during transit.

During the time the truck is being used for carrying milk or cream, nothing which may taint or contaminate dairy products is permitted to be conveyed on the truck. Animals, fertilizers, hides, skins or other malodourous things may not be carried at any time on a vehicle used for carting milk or cream. However, some carriers provide a false bottom and sides for use on the truck when carting such goods, and provided the vehicle is well cleaned before being used again for carrying milk or cream, no objection is raised.

A trailer may not be used by the carrier unless the conditions of its use are approved by an inspector. The carrier cannot dispose of his business without the consent of the factory owner and the Minister, and the factory owner must certify that the price to be paid by the purchaser is fair and reasonable; no goodwill is allowable.

The licensed carrier is protected against encroachment on his route by any other carrier, as it is an offence for any person to pick up and convey cream on a notified cream route or milk on a notified milk route unless he has a licence for that route. It is not sufficient that he has a licence for another route.

It is pointed out that it is not an offence for an unlicensed cream carrier to travel over a road on a notified route provided he does not pick up cream supplies thereon; it is often necessary for a carrier to travel a road (particularly when converging on the factory) which is not on his route in order to get to the factory.

It is an offence for a licensed carrier to pick up and convey cream or milk other than cream or milk consigned to the factory specified on his licence or to convey cream or milk to a factory or loading point other than that specified on his licence.

Supplier's Position

The factory owner is bound to pay to a supplier the whole of the price payable for milk or cream supplied to the factory owner unless the supplier authorises the payment in whole or in part of such price to some other person, or unless the law authorises payment other than to the supplier. The factory owner, therefore, without authority from the supplier, cannot deduct the cost of cartage of milk or cream received from the supplier. A clause of the form of agreement provides for the carrier to obtain from the farmer for passing on to the factory a written authority for deductions for cartage. If a farmer refuses to sign such an authority form, the carrier is not obliged to convey the produce as the farmer must pay for the service provided. On the other hand, the carrier is not entitled to payment if a supplier does not utilize the service, but conveys his own milk or cream to the factory, or sends it by railway.

A farmer who does not wish to use the service provided by the carrier may convey the produce from his own farm along the notified route, but he is not permitted to carry the produce of any other supplier. However, where any farms are not situated on a notified route the owners may organize a community service amongst themselves.

This is done in some places where farmers arrange a "feeder" service from their area to a point on a notified route where the cream is then taken on to the factory by a licensed carrier.

Transport Committee

The Act gives complete authority to the Minister in all matters affecting transport of milk and cream. Provision is made for a committee of three to be appointed to report and make recommendations to him. The committee is empowered to co-opt the services of any dairy inspector.

The Minister may refer any dispute which arises in connection with milk or cream transport to the committee. However, the policy is for the committee to investigate and report on disputes between associations, but a dairy association is expected to arbitrate in any dispute which is purely of a domestic character and does not involve any other association.

The Department usually requires any request for an investigation to be submitted in writing, and any improper practices which are alleged to have been adopted by the association, or other grounds for inquiry, to be specifically indicated. If the issue or transfer of a carrier's licence is involved, action is withheld pending the result of the investigation.

Cancellation of Licence

The agreement provides for its termination by either the factory owner or carrier giving the other three months' notice of intention to do so. It also provides for cancellation by the factory owner if a carrier defaults in the performance and observance of the conditions of the agreement. In this case, there is no need for the factory to give three months' notice, and it may cancel the agreement in as short a time as it decides.

The latter provision may be invoked by a factory if a serious situation arises which necessitates prompt action to cancel the agreement, while the three months' notice may be availed of if the circumstances do not justify such an urgent course of action.

Variations in Costs

There is a clause in the agreement which permits a variation in the cartage costs during its currency in accordance with a rise or fall in certain costs of operating the service. The items which are taken into account for the determining of any such increase or decrease are petrol, oil, wages, tyres and vehicle registration fees. These are readily ascertainable costs over which the carrier has no control. Costs of maintenance and depreciation of vehicle are not included in the items. They are dependent on the condition of the vehicle, care exercised in its use, roads and other factors which cannot be specifically determined on a uniform basis through the State. Moreover, these two costs should be estimated and allowed for by the carrier at the time of tendering for a milk or cream cartage contract.

Points of Pick Up

The agreement which a carrier enters into with a dairy association deals with the picking up of milk or cream on or adjacent to the route. According to the Act, the road is on the notified route. There is thus no obligation for a carrier to pick up supplies from a dairy shed, and if such a service is given it is purely a matter for mutual arrangement between the carrier and the farmer, as is also any increased charge for the privilege of dairy pickup. Some associations and carriers insist that the farmer should provide grids in lieu of gates to gain access to the dairy shed and a reasonably trafficable farm road, if milk or cream is picked up at a dairy shed.

Owing to the possibility of a vehicle becoming bogged in wet weather on the farm road between the roadside gate and the dairy shed, carriers often do not enter the farm to pick up cream in wet weather even if such a service is given during dry weather. Arrangements are made for the farmer to take the cream to the roadside during such times.

The picking up of milk or cream at dairies is an established custom in some districts, especially where the farms are large and the dairies an appreciable distance from the roadside. With the increasing use of refrigeration on farms it would be a retrograde step not to keep milk or cream in the refrigerator as long as practicable before being picked up by the carrier for transport to the factory. Therefore, the Cream Transport Committee has taken the attitude that a roadside or dairy pick-up is really a matter to be determined locally in the light of the circumstances pertaining to each case. However, a cream or milk carrier cannot be compelled to enter private property.

As dairy associations take delivery of the farmer's produce only at the factory, they are not liable for any loss or damage to milk or cream by a carrier while in transit from the farms to the factory. A milk or cream carrier is not a common carrier and unless there is negligence on his part he cannot be held responsible for any such loss or damage. The risk is, therefore, the supplier's own.

Wholehearted Acceptance

Though there may be an impression by one who has not had experience of the Queensland system that it interferes with the liberty of the individual, avoids competition "which is the soul of business", and could lead to inefficiency on the part of the companies by virtue of the protection of their supply areas, the system is wholeheartedly accepted by the dairy industry of the State. It is beneficial to the suppliers, for any unnecessary duplication of transport services can only be at the expense of the producer.

A cardinal point in the Departmental policy is that a route can only be protected for a factory provided that the price it pays to the suppliers is equivalent to that of a neighbouring factory. If this is not so and the suppliers on any route or part of a route by a substantial majority request inclusion on a route notified to a neighbouring company which pays a higher price for milk or cream, the request is normally acceded to.

WATER HARVESTING AT COOROY

It is not generally realised that Australia is the driest of all the continents. Water run-off to the ocean from all Australian streams has been estimated at merely half the flow of the Mississippi in the U.S.A. Water harvesting will become more important as our State develops. Mr. T. Quinn, Cooroy, has faith in the future of water harvesting and irrigated improved pastures. His 6,000,000 gal. dam is being used to spray irrigate eight acres of pasture sown in April–May, 1959.

Tuberculosis-Free Cattle Herds

(As at 1st January, 1960)

Aberdeen Angus

Crothers, G. H. & H. J., "Moorenbah", Dirranbandi
Elliott, A. G., "Ooraine", Dirranbandi
Mayne, W. H. C., "Gibraltar", Texas

A.I.S.

Cox, T. L. & L. M. J., Seafield Farm, Wallumbilla
Crookey, J., Arolla A.I.S. Stud, Fairview, Allora
Davis, W. D., "Wamba", Chinchilla
Dennis, L. R., Diamondvale A.I.S. Stud, Mundubbera
Edwards Bros., "Spring Valley" A.I.S. Stud, Kingaroy
Evans, E. G., Lauraven A.I.S. Stud, Maleny
Green, D. B., Deloraine A.I.S. Stud, Fairdale
Heading, C. A., "Wilga Plains", Maleny
Henry, Mrs. K., Greenmount
Henschell, W., "Yarranvale", Yarranlea
H. M. State Farm, Numinbah
Littleton, H. V., "Wongalea", Hillview, Crow's Nest
Marquardt, A. C. & C. R., "Cedar Valley", Wondai
Mears, G. S. & E., "Morden", M. S. 755 Toogoolawah
Moore, S. R., "Sunnyside", West Wooroolin
Neale, D. G., "Groveley", Greenmount
O'Sullivan, Con., "Navillus", Greenmount
Phillips, J. & Sons, "Sunny View", Benair, Kingaroy
Power, M. F., "Barfield", Kapaldo
Queensland Agricultural High School & College, Lawes
Radel, R. R. & Sons, "Happy Valley", Coalstoun Lakes
Roche, C. K., Freestone, Warwick
Sanderson, W. H., "Sunlit Farm," Mulgildie
Schloss, C. J., "Shady Glen", Rocky Ck., Yarraman
Scott, M. E. & E., "Wattlebrae" A.I.S. Stud, Kingaroy
Scott, W. & A. G., "Walena" A.I.S. Stud, Blackbutt
Shelton, R. A. & N. K., "Vuegon" A.I.S. Stud, Hivesville, Murgo
Sokoll, A. H., "Sunny Crest", Wondai
Sperling, G., "Kooravale", Kooralgin, Cooyar
Sullivan Bros., "Valera", Pittsworth
Sullivan, D., "Bantry", Pittsworth
Sullivan, F. B., "Fermanagh", Pittsworth
Thompson, W. H., "Alfavale", Nanango
Webster, A. H., "Millievale", Sabine, via Oakey
Wieland, A. W., "Milhaven", A.I.S. Stud, Milford, via Boona

Ayrshire

Dudgeon, C. E. R., Marionville Ayrshire Stud, Landsborough
Dunn, T. F., "Alanbank", Gleneagle
Goddard, B., Inverell, Mt. Tyson, via Oakey
Holmes, L., "Benbecula", Yarranlea
Mathie, E. & Son, "Ainslie", Maleny
Scott, J. N., "Auchen Eden", Camp Mountain
Zerner, G. F. H., "Pineville", Pie Creek, Box 5, Post Office Gympie

Friesian

Behrendorff, E. C., Inavale Friesian Stud, M.S. 786, Boonah
Macdonald, S. E. G., "Freshfields", Marburg
Naumann, C. H., "Yarrabine", Yarraman
Pender, D. J., Lytton Road, Lindum
Stumer, A. O., Brigalow, Boonah

Guernsey

Doss, W. H., Degilbo, via Biggenden
Fletcher, A. B., "Cossart Vale", Boonah
Holmes, C. D. (owner Holmes L. L.), "Springview", Yarraman
Johnson, G. L., "Old Cannindah", Monto
Miller, G., "Armagh Guernsey Stud", Armagh, M.S. 428, Grantham
Ruge, A. & Sons, "Woowoonga", via Biggenden
Sanderson, N. H., "Glen Valley", Monto
Scott, C., "Coralgrae", Din Din Rd., Nanango
Swendson, A. C., Coolabunia, Box 26, Kingaroy
Wissemann, R. J., "Robnea", Headington Hill, Clifton

Jersey

Beckingham, C., Trout's Rd., Everton Park
Birt, W. C. M., Pine Hill Jersey Stud, Gundiah
Borchert, Mrs. I. L. M., "Willowbank" Jersey Stud, Kingaroy
Burrows, R. N., Box 23, Wondai
Bygrave, P. J. L., The Craigan Farm, Aspley
Carpenter, J. W., Flagstone Ck., Helidon
Conochie, W. S. & Sons, "Brookland", Sherwood Rd., Sherwood
Cramb, S. A., Bridge St., Wilsonton, via Toowoomba
Crawford, R. J., Inverlaw, Kingaroy
Farm Home For Boys, Westbrook
Fowler, P. & Sons, "Northlea", Coalstoun Lakes
Harley, G., "Hopewell", M.S. 189, Kingaroy
H.M. State Farm, Palen Creek
Hutton, D. R., "Bellgrath", Cunningham, via Warwick
Johnson, H. G., Windsor Jersey Stud, Beaudesert
Lau, J. F., "Rosallen", Goombungee, Toowoomba
Matthews, E. A., "Yarradale", Yarraman
McCarthy, J. S., "Glen Erin", Greenmount, Toowoomba
Meier, L. E., "Ardath Stud", Boonah
Noone, A. M. & L. J., "Winbirra", Mt. Esk Pocket
Porter, F., Conondale
Q.A.H.S. & College, Lawes
Ralph, G. H., "Ryecome", Ravensbourne
Scott, Est. J. A., "Kiaora", Manumbar Rd., Nanango
Semgreen, A. L., "Tecoma", Coolabunia
Seymour, B. T., "Upwell" Jersey Stud, Mulgildie
Smith, J. A. & E. E., "Heatherlea" Jersey Stud, Chinchilla
Tatnell, W. T., Cedar Pocket, via Gympie
Toowoomba Mental Hospital, Willowburn
Verrall, F. W., "Coleburn", Walloon
Weldon Brothers, "Gleneden" Jersey Stud, Upper Yarraman

Poll Hereford

Anderson, J. H. & Sons, "Inverary", Yandilla
Hutton, D. R. & M. E., "Bellgrath", Cunningham, via Warwick
Maller, W., "Bore View", Pickanjinnie
Maller, W., "Bore View", Gowrie Junction
McCamley, E. W. G., "Eulogie Park", Dululu
Wilson & McDouall, Calliope Station, Calliope

Poll Shorthorn

Leonard, W. & Sons, Welltown, Goondiwindi

Preparing Downs Lambs For Market

By C. R. Smith,
Senior Adviser, Sheep and Wool.

Darling Downs fat lamb breeders have some special problems which are dealt with in this article:

The nutritional needs of breeding ewes vary according to the different stages of their breeding cycle.

After their lambs are weaned, their demands are low. They are again low in early pregnancy. Between these two periods, for a space of time occupying three weeks before mating and for three weeks after rams are joined, they require a "flushing" diet. Then, in late pregnancy, for seven weeks or so before lambing, and after the birth of the lamb, to ensure a high milk supply during eight weeks of lactation, their food demands are high.

The following table gives some idea of the quantitative food requirements of big-framed breeding ewes at varying stages of the normal breeding programme:

In an effort to meet these varying food needs of the ewe, Darling Downs fat lamb farmers are faced with some particular problems of management. Irregular rainfalls and periodical droughts make fat lamb raising a more hazardous undertaking than in southern States.

Fat lamb production on the Darling Downs is invariably associated with some agricultural activity, of which grain growing is commonest. Sheep, because of their gregarious habits, their roving and foraging ability, and their natural manuring and compacting of agricultural soil country, form an admirable complement to grain growing. They graze and rid cultivated country of many unwanted weeds. Their natural excretions aid soil fertility, and the grain and crops on which they feed help to carry them over periods when natural pastures are inadequate even for maintenance.

TABLE 1

FEED REQUIREMENTS OF BREEDING EWES TO ENSURE EARLY MARKETED LAMBS

——	Food Units per Week	Equivalent amount of High Quality Lucerne per Head per Week lb.	Equivalent amount of Grain Sorghum per Head per Week lb.
Ewes, after weaning lambs, with condition being dropped prior to "flushing"	7	17·5	9·3
Ewes, being "flushed" for 3 weeks prior to mating, and 3 weeks after mating; preferably on green, lush feed	10	25	13·3
Ewes, after rams are removed; during first three months of pregnancy	7	17·5	9·3
Ewes, during last seven weeks of pregnancy ..	*Built-up from* 8 to 16	*Build-up from* 20 lb. to 40 lb.	*Build-up from* 10·6 lb. to 21·3 lb.
Ewes during lactation for approx. 8 weeks ..	16	40	21·3
When lambs are weaned ewes revert to ..	7	17·5	9·3

Plate 1

Turnips Grown for Sheep Food in the Warwick District.

Crop feeding and grain can be used to supply them with food to satisfy the varying demands of their bodies during breeding programmes, and to aid the periods of rapid growth in lambs destined for early marketing.

Crop Feeding Ewes and Lambs

Crop feeding is the main method of fattening lambs on Downs farms.

Winter-grown crops suitable for sheep requirements are generally more readily grown under Downs conditions than are summer crops of the type that provide short grazing suitable for sheep. To make crops available to ewes at lamb drop, and lambs during rearing, mating of rams with ewes is mainly carried out in November-December. Oats, rape, and turnips are sown in February, and these provide feed for the lambing that occurs in April and May. (See Plates 1 and 2.)

In some seasons, avid feeding of lambs on lush crops can cause scouring, and, in severe cases, may result in loss of bodily condition. To minimize this drawback, dry feed such as hammermilled hay and oat grain, or similar cereals, is provided.

These roughages can be fed in self-feeders.

To avoid the ewes getting an unfair share, and the lambs little or none, creep feeding is a practice that is becoming increasingly used on Downs farms.

Methods of Creep Feeding

For creep feeding, cereal hay and grain is hammermilled through a 1-in. screen. A ringlock netting and iron picket temporary yard is erected in a paddock adjacent to the sheep paddock, round and including a gate. A self-feeder which is kept filled with chaff and grain is placed in this enclosure, and ewes and lambs are given access to this. Lambs soon become acquainted with the gate entrance and the feed in the feeder. When lambs are about two months old, the gate is taken away, and a hardwood creep structure put in its place. (See Plate 3.)

The creep structure is strongly made from 3 in. by 1 in. hardwood, with the upright battens adjustable.

A second feeder is provided for the ewes outside the creep. This has the feeding height suitable for ewes, but out of reach of lambs. The ambs have access to their own feeder in the creep and the ewes remain contented.

Early weaning

Winter rain on the Downs is not always reliable enough to provide crops adequate to ensure a prolonged lactation for ewes rearing fat lambs. Often ewes have very little milk by September, and unless lambs are weaned and put on the best feed, there is insufficient feed to "finish" them for market, as well as to feed the ewes.

The ewes benefit from the weaning because t enables the sheepman to reduce their food intake temporarily.

With condition so reduced, an improvement in the ewes' feed is more easily obtained to give the flushing effect at joining. Flushing, particularly on green feed, increases the lambing percentage by increasing the number of ova shed. This results in more multiple lambings.

If the ewes were still fat from crop feeding at this time, flushing would be less effective.

This point has long been recognised in New Zealand fat lamb husbandry as of fundamental importance, and results in a time programme being adhered to to ensure that preparation of ewes for next mating is not hampered by delayed weaning.

The importance of adhering to early weaning practices to allow the ewe to be prepared for the next joining was also stressed in results from fat lamb trials in New South Wales.

Grain Chaff Supplement

On Darling Downs farms under seasonal conditions where the crops have deteriorated rapidly, and are sparse by September, it is advisable to provide the weaned lambs with a supplement of

Plate 2

A Crop of Rape in the Warwick District.

Plate 3
Lamb Using Creep on a Darling Downs Fat Lamb Farm.

grain and chaff—equal parts by weight. Lambs, already acquainted with supplementary feeding when with their mothers, will take readily to th feeders, especially if a few ewes are left with ther for company.

Isolate Ewes at Weaning

At weaning, the main body of ewes should b taken as far away from the weaned lambs a possible.

The isolation from the main body of mother prevents the ewes and lambs endeavouring t make renewed contact with one another, as the would try to do if only a fence divided them It also lessens the amount of prolonged calling c ewes to lambs, and lambs to mothers, that cause a good deal of distraction generally, and a failur of the mob to settle down within a reasonabl time.

* * *

Banana Planting Material

Growers who desire to sell planting material of Lady Finger or Sugar bananas during the 1960 planting season, which commences on August 1, 1960, are reminded by the Banana Industry Protection Board that permits to remove planting material of those varieties are granted only when the source of supply is an approved plantation.

To qualify for approval, a plantation must be well managed, free from Panama and Bunchy Top Diseases and the plant type must be up to recognised commercial standards. Two inspections of each nominated plantation will be made by officers of the Department of Agriculture and Stock.

The first inspection must be carried out som time between March 1 and May 31. Any plantation which is not inspected during that perio will not be eligible for approval. Growers wh may desire to sell planting material of th varieties named should therefore make application to the Board early enough to ensure tha the first inspection can be carried out withi the appointed period.

The second inspection will be carried out i the spring when applications to remove plantin material are received.

Application forms may be obtained from th district officers of the Department of Agriculture and Stock, and the completed forms shoul be lodged with the Board's agents as early a possible and not later than March 31, 1960.

A Service to Countrymen

They Saved Farms from Being Washed into the Sea

By E. T. HOCKINGS,
Editor of Publications.

Today, by calling on the technical advice of soil conservation officers, farmers are able to halt soil erosion—and so keep their land productive, profitable and in good heart.

SOIL conservation officers and farmers, by a perfect example of teamwork, have shown how, each year, we can save millions of tons of soil from being washed into the ocean. This is good farming soil; growing the produce that feeds our increasing families; soil that is now silting and damaging our roads and choking our ports; soil that must never be lost to the sea from which there is no return.

In our State of Queensland, the soil erosion story is one of determined action in the face of a growing threat.

It began about 20 years ago, at a time when the farmer who suffered damage to his land through soil erosion stood like one helpless in the face of nsurmountable difficulty. In most instances he did not even know what was happening to his precious soil; he was blissfully unaware of the nsidious drifting away of the top layers, which, f not arrested, would surely result in the abandonment of his productive acres.

The Department of Agriculture and Stock had for some time been conscious of the pressing need for a soil conservation service to farmers. But it was not able to establish such a service until 1947. By then, about 1,000,000 acres of eroded land required urgent remedial treatment. At the same time, new land was being broken up at the rate of 100,000 acres a year, most of t highly erodible black soil in areas of irregular rainfall.

The First Twenty

To make matters worse, farmers showed little interest in the problem; few indeed had any knowledge of it. Only about 20 farmers were applying conservation measures at that time. They had been encouraged to do so by a few keen Department advisory officers, who as early as 1935 saw the menace of soil erosion and set out to fight it.

Research Pays Off

A start has been made on soil conservation research, and in 1959 a method was developed for the cheap and effective stabilization of the numerous gullied drainage lines on the Darling Downs. The method involves the planting of kikuyu grass in July when runoff is normally low. Bitumenous emulsion is used as a growth stimulant and to bind the straw and netting cover which is utilized to provide temporary protection.

These men started the work but then the war intervened and further action was postponed.

In these early days, no staff was trained to apply soil conservation principles; no academic training was available in the colleges and universities. Moreover, Queensland's erosion problems appeared to be much more difficult to resolve than those of most other States.

In the first place, annual rainfall is higher (up to 180 in. a year at Tully) and includes a high proportion of intense summer storms and protracted monsoonal rains; secondly, soils used for cultivation are predominantly clays which at times have a very low infiltration or absorption rate.

These are the soils that grow winter crops on moisture stored through long fallows.

Any fallowed soil will erode if exposed to heavy rains, but with clay soils under a long fallow there is an additional hazard. When dry they have a high capacity for absorbing moisture and they retain it well. But when wet, they are unable to take in more than a minimum amount of rain—and runoff is consequently greater.

Demonstration Areas

So the Department appointed and trained staff, progressing from one officer in 1947 to a team of 24 in 1959. In this time, 20 demonstration areas were established in the main agricultural districts to show farmers what could be done with properly applied soil conservation measures and to allow them to judge the merit of the work.

These measures fall into two broad categories: (1) the construction of earthworks to provide for the controlled interception and disposal of surplus runoff; (2) the application of land use practices designed to protect the soil, to improve the intake of rain and to maintain soil fertility.

24 Men On Important Work

Of the 24 officers now engaged in soil conservation work, 15 are located in the Darling Downs region. Of these, two are engaged on drafting activities, two on research, and 11 on extension work in five centres. Six officers are in the Burnett area, five are stationed at Kingaroy, one at Murgon. These are virtually all engaged on extension work. One officer is at Emerald to assist in the development of these new lands on a sound soil conservation basis, and one is at Atherton to deal with the needs of the northern area. All these officers are under the control of the Chief Soil Conservationist, Mr. J. E. Ladewig.

As more and more farmers began to seek help from this soil conservation service, legislation was passed in 1951 including provision for the setting up of an advisory and co-ordinating committee on soil conservation.

This was to co-ordinate the actions of the various government departments and to advise on broad soil conservation needs.

From the beginning, all work had been based on a farm plan, which set out the soil conservation needs of each farm and enabled the planned development of programmes. After a few years it was plain that co-ordination of water disposal could not be achieved without simultaneously planning the conservation needs of all farms within a common drainage area.

So the group, or catchment planning, approach was developed, and these days few farms are planned as single units. Farmers now know in advance how their plans will dovetail with those of their neighbours and so a community attack is launched on the common enemy.

Preliminary plans on a scale of 10 chains to an inch have been developed for 1,500,000 acres in the Darling Downs and Burnett regions. Of this area, catchment soil conservation plans have so far been developed for areas aggregating 200,000 acres. The remarkable increase in the development of group planning is indicated by the fact that conservation plans will be completed for a further 250,000 acres in the one year 1959-60.

Conservation on 2,180 Farms

A decentralised extension (or advisory) service to farmers has been set up in most of the main agricultural areas. A great deal of work has been done by the soil conservation team and there are now 2,180 farms in Queensland applying conservation measures.

Protective earthworks have been installed on 77,000 acres of cultivated land. Of this, 16,500 acres were protected in 1958-59, an increase of 30 per cent. on the previous year.

In the South Burnett, where group activity is strongest, three farmer soil conservation groups have been established to ensure co-ordinated action within 12 catchment areas. Co-operating with this move, two local authorities in the area have formed their own sub-committees to attend to soil conservation matters.

The State Advisory Committee recognises the need for co-ordinated approaches and has set up district soil conservation committees in the Darling Downs, South Burnett, and Atherton districts

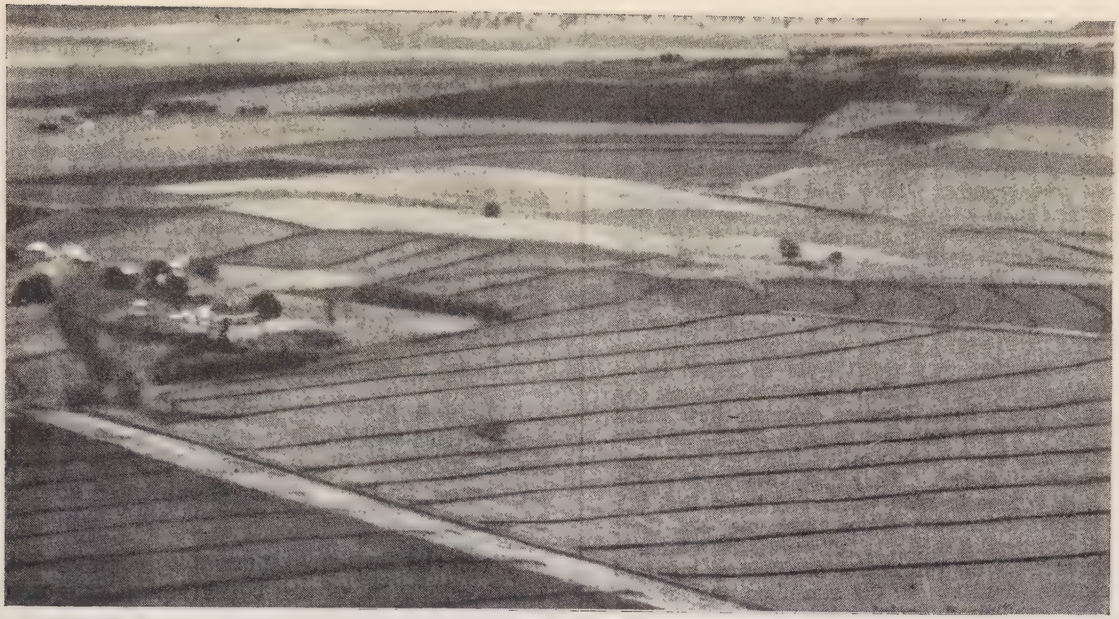


Plate 1

An Aerial View of Soil Conservation Measures on the Darling Downs

These district committees have representation from government departments and local authorities and thus provide the final step in the complete co-ordination of soil conservation group plans.

The Job Ahead

At the present time, 1,100,000 acres urgently require protective earthworks, and about 20 years is the minimum time that can reasonably be allocated to the job of bringing the situation under control.

This means that contour banks and associated earthworks need to be applied to 55,000 acres of eroded land each year, but it does not allow for treatment of at least part of the new lands being broken up for cultivation at the rate of about 100,000 acres a year.

The aim, therefore, must be to reach a rate of control of about 80,000 acres a year.

To meet such an objective will require herculean effort and, while the Government is doing a great deal and will continue to expand its technical services, it seems certain that this technical aid will have to be supplemented from other sources if the job is to be done in the time available.

Farmers must, therefore, proffer a measure of self-help by doing those things which are within their technical capabilities.

We Must Have Co-ordinated Plans

The most important service which the Department can give is the development of co-ordinated soil conservation plans since this task calls for technical skill and liaison in planning which cannot be provided by any other authority. Here the object is to develop plans for 10,000,000 acres in the State within 20 years. This would involve 80,000 man-days of technical time. The application of these plans in the field will involve 200,000 man-days for surveying sites for structures.

It seems unlikely that the Government can provide both services to the desired extent but in the case of the 200,000 man-days required for surveying work, the farmer can take a useful part.

The implementation of work on a group basis as agricultural drainage projects under the Local Government Acts might enable the objective to be reached. In this method the plan is drawn up by Departmental officers, provision is made for financial assistance by way of Treasury or debenture loans, and facilities are provided for survey,

Two Thousand Have Found the Answer

More than two thousand farmers have proved to their own satisfaction that it pays to invest in soil conservation. They find that the benefits accrue in many ways. It is reassuring to lie in bed during a heavy storm at night and know that the newly planted seed is still in place, and that the fields will be undamaged in the morning; that they won't have to re-work the paddock and plant again, or that the paddock of young wheat or peanuts will still have as many plants tomorrow as today; that they won't have to spend hours ploughing-in gullies before normal cultivation can commence. These farmers calculate how much productive land was lost through gullies and the extra costs involved in working between those that cannot be crossed. They have also watched the steady decline in crop yields and know that this has been arrested. They appreciate that there will be no quick return to full productivity because this requires the progressive adoption of balanced farming parctices. In the meantime, the security and immediate financial gains provide a positive incentive.

construction and supervision, the whole being done on a contract basis, under the direction of the local authority.

There is also another side to the control of soil erosion that is receiving attention by the Department. It is expected that research into land use problems by the technical officers dealing with crops and pastures will provide the lead for a change from the present unstable agricultural pattern to one in which a more balanced farming will prevail.

In this direction it will need to be remembered that if we applied principles of improved land use as quickly as we seize upon a newly released variety of wheat, a new grass, or a new weedicide the soil erosion problem would not loom so dangerously as it does.

Research will also be needed in the fields of hydrology and hydraulics to ensure that sound design precedes the construction of works.

Self-Help Important

Whatever methods are used to control erosion, and however much assistance the Department gives, the farmer is the key to achievement of the desired control rate. He must develop an interest in the problems; then in the control work; and finally should be prepared to do whatever is possible complementary to the work of the Department's technical services.

Where a group is sufficiently interested, the Department will conduct schools or other instructional methods directly applicable to the area concerned, and the farmer should take advantage of them.

When the Department provides a blue print for the development of soil conservation programmes on a farm, the farmer should do what he can to carry on from there.

On the construction side, he can help a lot, for experience has shown that the farm dozer unit can quite capably handle most soil construction jobs. Indeed, hundreds of them are now doing so throughout the State.

So, it will only be through concerted effort on the part of soil conservation officers, departmental technical officers, and the farmer himself, that the objective of control of the whole State's soil erosion problems will be finally reached. While the result cannot, perhaps, be measured in terms of money immediately gained, it is obvious that the amount of money saved will be past estimation.

And if a spur to further effort be required, a mental picture of the State in 20 years' time without soil conservation, ravaged and horribly eroded as it would be, should suffice.

◆

Common Weeds of Farm and Pasture

by S. L. Everist, B.Sc., Government Botanist.

A handbook that contains brief descriptions of about 110 of the common weeds of Queensland with notes on their distribution and control.

Price to Queensland farmers	5s.
To others	7s. 6d.

Available from Department of Agriculture and Stock, Brisbane.

pasture and crop

Don't Machine-pick Empire Cotton.—Plant the cotton variety Empire only if you intend to have your crop picked by hand. If your crop is to be machine-picked, grow Miller 43–9–0 or New Mexico Acala.

Machine-harvested Empire cotton gives low-grade lint at the ginneries. But when picked by hand, this variety produces top grade lint and gains premium payments.

Empire cotton has a long staple and fine fibres. When it's machine-picked, these fibres tend to hold more leaf and trash than the shorter fibres of Miller, for example. The difficulty of removing this trash and the breaking of fibres during the cleaning process cause Empire cotton to be down-graded. When improved ginning and cleaning machinery is installed at the Rockhampton ginnery, it should be possible to lift the grades of machine-harvested Empire cotton.

—*I. J. L. WOOD,*
Adviser in Agriculture.

Our Best Pasture Legume.—It has taken a long time to break the unfortunate habit of regarding lucerne as a specialist hay crop.

Nowadays, of course, we know that lucerne is a fodder plant of many uses, and one of extreme value in almost any pasture.

We know that it doesn't need the long and expensive seed bed preparation usually given for hay stands.

It can be established at low and economical seeding rates, with or without associated pasture grasses. Mixed with grasses, of course, the risk of bloat is minimized.

Even in drought, many farmers have found the short pick it gives then absolutely invaluable in raising the digestibility of their dry native pastures.

Lucerne is a pasture plant worth growing. It is the summer legume so many graziers have been looking for, for so long.

—*J. L. GROOM,*
Senior Agronomist.

Read Label On Weedkillers.—Read the label carefully before you mix up a chemical weedkiller, and you'll avoid a lot of costly mistakes. Labels on tins or packets of chemical weedkiller are put there for the farmer's protection. In Queensland, the labels are required to carry full directions for use. In addition, it is an offence for a manufacturer's label to make false claims about the efficiency of the preparation.

Chemical weedkillers are classified into selective and non-selective groups. A selective weedkiller, used at the correct strength, will kill certain types of plants but be harmless to others. Choose the particular chemical to which the weed is susceptible and the crop is tolerant. For example, PCP can be used to control weeds and grasses in pineapples; 2,4-D or MCPA can be used in cereal crops; and CMU or Dinoc to control weeds in onions.

Non-selective weedkillers will destroy all plant life and should not be used in crops. Arsenic and the chlorates are examples of this group.

In using chemical weedkillers, first make sure the preparation is safe for the crop. If it is poisonous, treat it as such and don't risk your life or endanger your stock. Be sure to use the correct chemical for the job and at the right strength. All this information is on the label.

—*N. D. IRWIN,*
Standards Branch.

Emery Wheels on the Farm.—Nowadays, an emery wheel is an essential part of any well-equipped farm workshop. Although useful, it can also be extremely dangerous and misuse can cause serious accidents leading to loss of sight and even of life. To prevent eye injuries, always wear goggles when grinding.

To reduce the possibility of a wheel bursting, make sure that it is correctly mounted so as to eliminate vibration, that it is kept true, and that it never exceeds the speed recommended by the manufacturer.

To prevent jamming, adjust the feed rest to reduce to a minimum the clearance between it and the wheel.

Finally, always keep the pressure on the wheel below that which would reduce its speed.

—*C. G. WRAGGE,*
Agricultural Engineer.

Scrub Tick Paralysis In A Crow

by P. D. RANBY, Veterinary Officer.

This is a female scrub tick (*Ixodes holocyclus*) removed from a fledgeling crow. The fledgeling was found by a farmer early one morning on a dairy property in the Numinbah Valley.

About noon on the same day, the crow was seen to be weak in the legs and soon became paralysed. The partially engorged tick was then seen attached to the bird's head, just above the base of the beak.

The crow died in the evening as a result of tick paralysis.

Since the scrub tick must be attached for several days before producing paralysis in animals, it seems likely that this tick attached itself to the crow fledgeling in the nest.

This farmer had reported earlier that he had paralysis cases in his calves over the last month. Five of the six affected calves died in two to three days. One or two ticks were seen on each calf. The calves were allowed to wander through scrub. It is likely, therefore, that these were also cases of tick paralysis. The owner was advised to run the calves on cleared land, away from the scrub.

The scrub tick is normally harboured by bandicoots. The larval ticks climb foliage and are picked up by passing animals, including man. The scrub ticks are most troublesome in bush areas where bandicoots abound. They are favoured by warm, humid conditions. This tick may be recognized by its long mouth parts (see Plate 1).

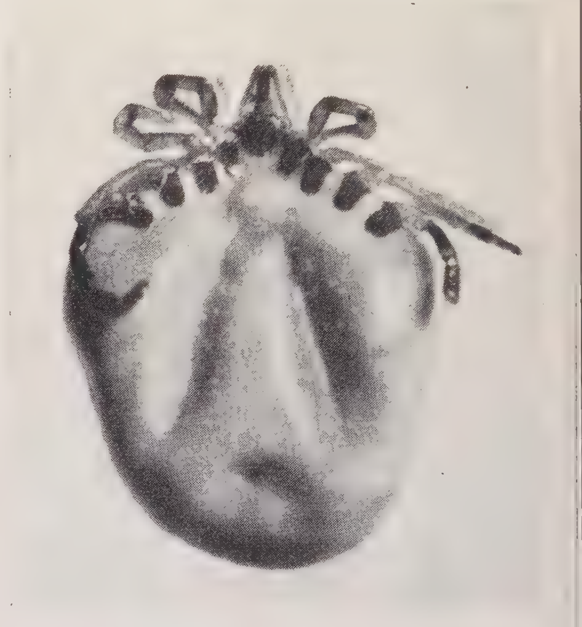


Plate 1
A Photographically Enlarged Female Scrub Tick

Tick paralysis due to the scrub tick is not uncommon in dogs and cats in certain areas. Occasional cases are reported in calves and foals. The cattle tick (*Boophilus microplus*) which is common on cattle in Queensland does not cause paralysis.

Septicaemic Cholera in Poultry

By P. D. RANBY, Veterinary Officer.

Outbreaks of septicaemic cholera in poultry can be halted by treatment with suitable antibiotics.

Septicaemic cholera produces a severe sickness in poultry caused by a virulent form of the cholera bacillus (*Pasteurella septica*). Outbreaks are more common in ducks and geese; duck cholera can be a hazard in rearing ducklings. The disease is much less common in fowls, pheasants and turkeys but where outbreaks do occur, death-losses can be high.

Among other birds, natural outbreaks occur in pigeons and waterfowl. Small birds such as sparrows and finches can be readily infected by experimental means, but it is not known whether natural outbreaks occur in these species.

It is the virulent form of the cholera bacillus which enters the bloodstream, where it rapidly multiplies to produce a blood infection or septicaemia. This produces the severe sickness and rapid deaths.

Milder strains of the organism are much more common in fowls than the virulent type, however, being associated with respiratory disease and swollen wattles.

This low virulent type can also be found in the upper respiratory tract of apparently normal fowls.

Does Not Persist

Fortunately, the septicaemic form of fowl cholera does not persist from year to year on affected farms. Instead, the disease "fizzles out" in one or two years. The reason for this is not clear, but there are two possibilities:

(*a*) That the virulent form of the cholera bacillus is unable to survive for very long either in infected birds or on the ground. As a result, the infection tends to disappear once all birds have been affected.

(*b*) That the virulent type of organism reverts back to the milder type. This is supported by the finding that types of intermediate virulence occur some time after a severe outbreak, and the fact that the carrier rate was high in the next season's birds even with few signs of the disease.

How Outbreaks Start

Overseas, outbreaks have started after the introduction of "carrier" fowls and the feeding of uncooked poultry offal. However, the origin of many of the outbreaks in fowls cannot be explained. In ducks and geese the situation is rather different in that "carriers" of the virulent organism are relatively more frequent than in fowls.

Severe outbreaks with large numbers of deaths around lakes have been observed in waterfowl in the U.S.A. Since all exudates from affected birds are infectious, rapid spread by contaminated water would occur. In Holland, an outbreak in geese was traced to affected waterfowl using the same ponds, while an outbreak in chickens followed the feeding of offal from a wild duck.

The possible importance of wild birds in spreading infection to fowls should be kept in mind until we know whether natural outbreaks occur among them.

Eggs are probably not a source of infection to hatching chickens even though the cholera bacillus has been isolated from eggs. Infections in young chickens and ducklings are rare.

Symptoms Severe

Outbreaks of both duck and fowl cholera have been observed in southern Queensland.

Thus in an outbreak in ducks at Brookfield in early 1959, six out of nine ducklings (two months old) died, while several adult ducks also succumbed. Affected ducks became weak in the legs and had difficulty in walking. Death would follow in a few hours.

In fowls, septicaemic cholera causes rapid deaths, especially early in the epidemic, As the outbreak continues, many affected birds survive longer—for one or two days—and usually develop a watery diarrhoea. Recently recovered birds may show the localized forms of infection. An epidemic may last for two or three weeks. Birds of any age except young chickens are affected in natural outbreaks.

Case History

The following outbreaks in fowls in the Brisbane area in September, 1956, are of interest:

The owner reported that he had a severe sickness in a pen of 250 cross-bred cockerels 12 to 14 weeks old. A number of sick and dead birds were present at the time of the visit (see Plate 1), while a nearby incinerator revealed the charred remains of many more.

Plate 1

A Case of Septicaemic Cholera in a 12-week-old Cross-bred Chicken. This bird was still in good condition and had been affected only a few hours. Note the extreme depression.

The trouble had been present for a week and about 25 dead birds had been removed from the pen. About 20 per cent. of the flock were affected by a watery diarrhoea and usually these cases had lost weight. Other affected birds would die in good condition in three or four hours.

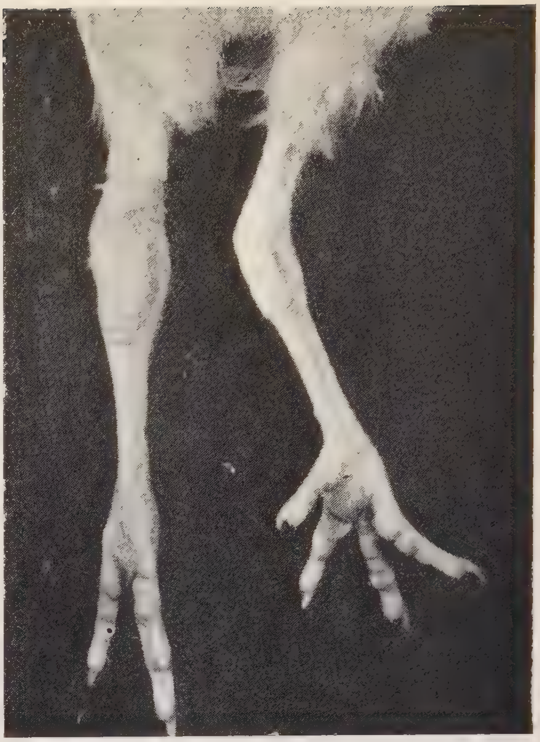


Plate 2

Septicaemic Cholera. Note the swelling around the left hock-joint and up the leg. A small proportion of such cases were seen in this cholera outbreak.

Odd cases showed swellings on the legs—on the feet and hock joints as shown in Plate 2. Towards the end of the epidemic, occasional cases showed a peculiar nervous disorder as seen in Plate 3. About 3 per cent. were thus affected and showed a periodic swaying and twisting of the head with a tendency to squat. It is uncertain whether these symptoms were a direct effect of the septicaemic cholera.

Infection spread to a pen of mixed birds 3 to 4 months old but not to older fowls on the farm.

Treatment with oxytetracycline (Terramycin) in the drinking water produced a definite improvement in the birds in two days and the disease had waned by the end of the second week.

Relapse After Dubbing

Two weeks later, a flare-up of the disease occurred after the owner had dubbed 200 of the cockerels (removed the comb and wattles).

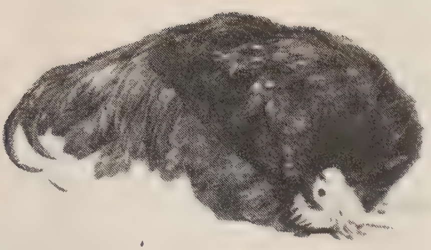


Plate 3

Nervous Symptoms Following an Attack of Septicaemic Cholera. The cockerel was swaying its head from side to side and would twist it to the ground. About 3 per cent. of such cases were seen at the end of the outbreak.

Twelve of the cockerels died within a few days of dubbing while the remaining birds appeared very dejected. Severe swellings were present on the sides of the birds' faces and in the cut wattles, while the combs appeared black. These swellings contained a dryish pus. Undoubtedly the dubbing operation had caused the relapse. Only a few cases of "wattle disease" were seen in the undubbed birds and these were much less severe.

Be Sure It's Cholera

Whenever severe sickness, diarrhoea and rapid deaths occur in poultry over one month old, the septicaemic form of cholera should be suspected. However, the disease can be confused with several others—chick nephritis (uraemia), staphylococcal infection and perhaps bluecomb. These can be readily sorted out with veterinary assistance.

Post-mortem findings in acute cholera show variable bleeding points in the heart wall, internal membranes and abdominal fat. The liver of some cases (especially in ducks) is congested and shows haemorrhages under its capsule or there may be grey areas of dead tissue. Other variable signs of septicaemia may also occur. In cases that die rapidly, internal changes may be few or absent. Thus several birds should be opened for examination.

The presence of cholera can be readily confirmed by testing for the presence of the causative bacteria in the various organs.

Treatment

Outbreaks of septicaemic cholera can be halted by treatment with suitable antibiotics. Sulphonamide drugs may also be used but are not so effective. Where antibiotic injections are used, advice may be sought from the Department of Agriculture and Stock.

Procaine Penicillin—Inject procaine penicillin into the breast muscle in 1 millilitre of clean water at a dose of about 20,000 units to each bird.

If the outbreak of cholera is severe, the injection will need to be repeated in 48 hours, or alternatively, treatment continued with a suitable medicament in the drinking water.

Procaine penicillin is fairly cheap (about one-fifth of a penny per bird).

Streptomycin—Streptomycin is injected in the same way as penicillin and is about equal in value.

Minimum dose-rates are:

Chickens half to three-quarter grown (9 to 14 weeks old): 100 milligrams.

Chickens three-quarter grown or more (over 14 weeks old): 150 milligrams.

Again, in severe outbreaks, the injection may need to be repeated or treatment continued with a suitable medicament in the drinking water.

Cost of 100 milligram dose of streptomycin is about 3d.

Terramycin and Aureomycin—These are supplied in the drinking water for 5 to 7 days as directed by the manufacturer. They are slower in action than antibiotics given by injection.

These antibiotics are more effective by injection but are not available in the injectable form at a price economic to use.

Sulphonamide Drugs—Supply in the drinking water as directed. Less effective than the other treatments and a little expensive for adult birds. Sulphonamide drugs are often available on poultry farms for immediate use.

Other Points to Watch

If possible, clean out the litter and replace it with clean litter while the birds are being treated. In the case of ducklings, it may be easy to shift them to new ground.

Brucellosis-Tested Swine Herds

(As at 1st January, 1960)

Berkshire

Clarke, E. J., Mt. Alford, via Boonah
Cochrane, S., "Stanroy", Felton
Cook, F. R. J., Middle Creek, Pomona
Crawley, R. A., Rockthorpe, Linthorpe
Edwards, C. E., "Spring Valley" Stud, Kingaroy
Farm Home For Boys, Westbrook
Fletcher, A. C., "Myola" Stud, Jimbour
French, A., "Wilson Park", Pittsworth
H. M. State Farm, Numinbah
H. M. State Farm, "Palen" Stud, Palen Creek
Handley, J. L., "Meadow Vale", Lockyer
James, I. M. (Mrs.), "Kenmore" Stud, Cambooya
Kimber, E. R., Block 11, Mundubbera
Law, D. T., "Rossvill" Stud, Aspley
Lees, J. C., "Bridge View" Stud, Yandina
Ludwig & Sons, A. R., "Beau View" Stud, Beaudesert
O'Brien & Hichey, J., "Kildurham" Stud, Jandowae East
Orange, L. P., "Hillview", Flagstone Creek
Pfrunder, P. L., Pozieres
Potter, A. J., "Woodlands", Inglewood
"Tayfield" Stud, Taylor
Q.A.H.S. & College, Lawes
Regional Experimental Station, Hermitage
Rosenberger, N., "Nevrose", Wyreema
Schellback, B. A., "Redvilla" Stud, Kingaroy
Smythe, E. F., "Grandmere" Stud, Manyung, Murgon
Stark, H. L., "Florida" Stud, Kalbar
Thomas & Sons, F., "Rosevale" Stud, Laravale
Traves, G., "Wynwood" Stud, Oakey
Weier, V. F., "La Crescent", Clifton
Wolski, A., "Carramana", Warra
Young (Jnr.), W., Kybong, via Gympie

Large White

Assenbruck, C., Mundubbera
Barron Bros., "Chiltern Hill", Cooyar
Bell & Son, E. J., "Dorne", Chinchilla
Butcher, Dr. B. J. & Parnwell, A. J., Plunkett, via Tamborine
Clark, L. D., Greens Creek, Gympie
Duncan, C. P., "Hillview", Flagstone Creek
Fowler, S., "Kenstan", Pittsworth
Franke, H. J., "Delvue" Stud, Cawdor
Garawin Stud Farm Pty. Ltd., 657 Sandgate Rd., Clayfield
Gibbons, A. E. H., Mt. Glorious
Gibson, H., "Thistleton" Stud, Maleny
H. M. State Farm, Numinbah
Hall, M., "Milena" Stud, D'Aguilar
Heading, J. A., "Highfields", Murgon
Horton, C. J., "Mannuem Brae" Stud, Mannuem, Kingaroy
Hutton, G., "Grajea" Stud, Cabarlah
Jensen, S., Rosevale, via Rosewood
Jones, K. B., "Cefn" Stud, Clifton
Kahler, J. & S., East Nanango
Kanowski, A., "Exton", Pechey
Kennard, R. B., "Collar" Stud, Warwick
Larsen, H. L., "Oakway" Stud, Kingaroy
Law, D. T., "Rossvill" Stud, Aspley
Lees, J. C., "Bridge View", Yandina
Lobegeiger, L. C., "Bremer Valley" Stud, Moorang, via Rosewood
Mack, A. J., Mundubbera
Palmer, A., "Remlap", Greenmount
Pampling, G., Watch Box Rd., Goomeri
Postle, R., "Yaralla" Stud, Pittsworth
Powell, R. S., "Kybong", Gympie
Q.A.H.S. & College, Lawes
Radel, V. V., Coalstoun Lakes
Regional Experimental Station, Biloela
Robinson, O. R. & O. J., "Linvale", Argoon, Biloela
Skyring, G. I., "Bellwood" Stud, via Goomeri
Stanton, H. R., "Tansey" Stud, via Goomeri
Stewart, L., Mulgowie, via Laidley
Stumer, K. F., French's Creek, Boonah
Wharton, C. A., "Central Burnett" Stud, Gayndah
Wieland, L. C. & E., Lower Cressbrook, Toogoolawah
Zahnow, W., Rosevale, via Rosewood

Tamworth

Armstrong, H. J., "Alhambra", Crownthorpe, Murgon
Booth, J. D., Swan Creek, Warwick
Campbell, P. V., "Lawnhill" Stud, Lamington
Coller, R. H., Tallegalla, via Rosewood
Fletcher, A. C., "Myola" Stud, Jimbour
Herbst, L., "Hillbanside", Bahr Scrub, Beenleigh
Kajewski, W., "Glenroy" Stud, Glencoe
Kanowski, S. E., "Miecho", Pinelands
Potter, N. R., "Actonvale" Stud, Wellcamp
Regional Experimental Station, Kairi
Salvation Army Training Home For Boys, "Canaan" Stud, Riverview
Skerman, D. F. L., "Waverley", Kaimkillenbun
Stephen, T., "Withcott" Stud, Helidon
Thomas & Sons, F., "Rosevale" Stud, Laravale
Wieland, L. C. & E., Lower Cressbrook, Toogoolawah

Wessex Saddleback

Ashwell, J., "Green Hill", Felton South
Cooper, G. J., Neumgua
Douglas, W., "Greylight" Stud, Goombungee
Dunlop, J. B., "Kunawyn", Acacia Rd., Kuraby
Kruger & Sons, "Greyhurst" Stud, Goombungee
Law, D. T., "Rossvill" Stud, Aspley
Mack, A. J., Mundubbera
Scott, A., Wanstead Stud, Grantham
Smith, C. R., "Belton Park", Nara
"Wattledale" Stud, 432 Beenleigh Rd., Sunnybank

Large Black

Pointon, E., Goomburra

Landrace

Grayson, D. G., Killarney
Neilsen, L. R., "Sunny Hill", Ascot, via Greenmount

Quality Is Essential In Barley

By W. T. KELSO, Senior Cereal Chemist,
and D. P. LAPIDGE, Marketing Officer.

Always a quality market, the barley market is at present undoubtedly the most discriminating of all the grain markets. This is quite understandable in view of the varied uses to which the grain is put. This article outlines these uses and the quality factors which are required to meet them.

Out of last season's production of barley in Queensland, amounting to 180,000 tons, local malsters accounted for less than 3,000 tons, whilst domestic stock feed and the interstate trade accounted for some 27,000 tons and seed requirements a little over 6,000 tons. The remaining 144,000 tons or 80 per cent. of the total crop was exported to overseas countries.

By far the greater part of the Queensland crop is now of the 2-row Prior variety. This variety, which was only introduced here a few years ago, has rapidly replaced the previous 2-row Chevalier, which was grown in earlier years. A small area of some 25,000 acres or 10 per cent. of the total is planted to 6-row Cape barley. This is mainly used locally for stock feed, although small quantities are also exported.

Production Areas

Barley is grown in the wheat-producing areas as a winter crop. The Darling Downs is by far the major producing area but the Burnett and Western Downs also contribute significant quantities, whilst smaller areas are grown in other districts, including the Central Queensland Highlands, Dawson-Callide, Inglewood, Lower Dawson, Maranoa, South-West Downs and coastal valleys east of the Downs.

Planting time varies according to soil moisture conditions but usually ranges from May to August, with May and June generally preferred if soil conditions are satisfactory. In view of the fact that only one 2-row variety is grown extensively at present the question of early or late varieties does not enter into the planting programme. In a normal season the main crop matures between mid-October and mid-November but the harvesting of later crops extends beyond this period.

Current Export Picture

The local market still remains important, particularly the stock feed market, which is capable of marked expansion in times of drought or of failure of the wheat, maize or grain sorghum crops. However, it is apparent that, with 80 per cent. of the crop destined for overseas markets, the main concentration of effort in the field of marketing must be on meeting the demands of overseas buyers. It is to this end, therefore, that most of the present work on handling, marketing, and research is being directed.

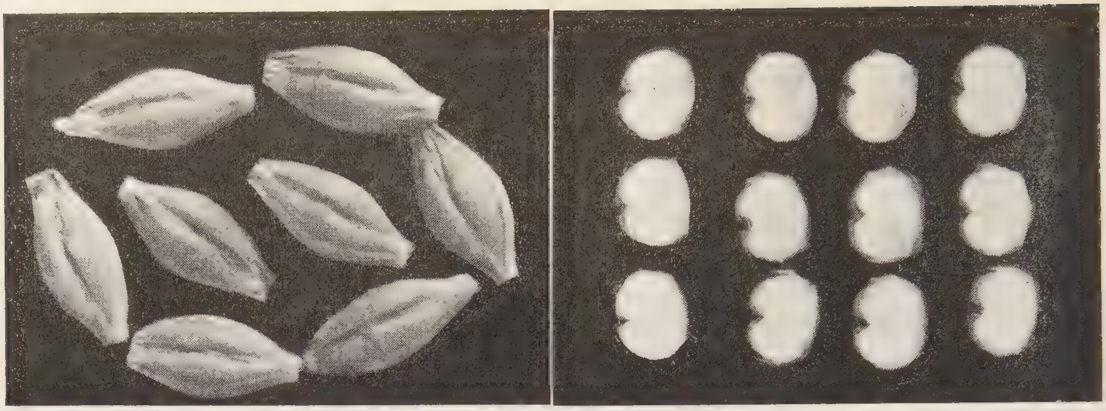


Plate 1

Malting Barley and (at right) Malting Barley in Cross Section.

It is also on these markets that the question of quality is crucial.

In considering export markets it must be borne in mind that exports from Queensland form only a small proportion of world trade in barley. The most recent figures put world trade at around 6,500,000 tons, of which last year we supplied only 144,000 tons. Our main competitors on the world's markets are Canada, United States of America, South Australia, France and the Argentine. Other countries, particularly Iraq and Syria, also provide competition, mostly on the feed market. Our main buyers are Japan, the United Kingdom and the European Continent, with other markets in Africa, the Middle East and at times South-East Asia coming in for smaller quantities. The importance of the Japanese and United Kingdom-Continent markets is illustrated by the fact that last year Japan took 78,000 tons of Queensland milling barley whilst the U.K.-Continent took 34,000 tons of malting and distilling and some 30,000 tons of feed.

With large crops in the hands of competing exporters and with the present tendency of normal importing countries to expand domestic production and reduce imports, these markets are highly competitive. Importers in most years are now able to pick and choose and do not hesitate to do so.

With this rather uncertain background, there is no guarantee of an assured market in any one country for a specific quantity of barley from year to year, and the exporter who is able to offer the quality most suitable to the buyer i usually the successful one. So far, Queenslan has done well in securing markets for the entir exportable surplus. In order to maintain an expand those markets, however, it is essentia that even more attention be paid to meeting th buyers' requirements as closely as possible.

Quality Requirements

Broadly speaking, barley can be classified int four categories in accordance with the use t which it is to be put. These categories are malting distilling, milling and stock feed.

It should be emphasised that the relativ market values of malting, distilling, and millin barleys are dependent to quite a large extent on th supply and demand for each type, and this ca change markedly from year to year. However, al three categories normally attract a fairl substantial margin over and above the feed price

This margin may range as high as £7 a to and sometimes more in the case of good quality malting barley when this in short supply Margins of £3 to £5 a ton are quite common fo both malting and distilling barleys.

Returns from milling barleys are influence mainly by the supply position in Japan and by shipping freights, but the advantage at ports here in Queensland over the export feed price ofte ranges from £2 a ton upwards. At times, however, the export price for this barley may be little above the feed price.

It will be seen, therefore, that quality pays in wo ways. Firstly, it enables the crop to be sold nore readily and secondly it results in a much igher return to the farmer.

Malting, distilling and milling barleys have airly specific requirements as their ideals, as far s quality is concerned. The fourth category, eed, usually consists more or less of all barley f merchantable quality which will not pass nuster for the other three grades and need not be lealt with at any length.

Naturally barleys coming within each of the irst three categories cover quite a range as far as uality is concerned, but perhaps the best method f delineating them is to describe the ideal requirements of each.

Firstly, all three categories have a number of lesirable features in common. These are :—

(1) Regular size, shape and colour.
(2) High bushel weight.
(3) High 1,000 kernel weight.
(4) A minimum of unsound or broken grains.
(5) A high standard of purity (that is, freedom from foreign matter of all sorts).

After meeting these conditions, however, the equirements diverge, quite considerably in the ase of the malting and milling grades, and the lesirable features of each grade are given in the ollowing paragraphs—

Malting—The malting grade is perhaps the most exacting of all and has less latitude than the others. In order to ensure a high extract of good quality malt the grain must adhere to a complex chemical requirement.

Firstly, the grain must be capable of germinating quickly and evenly. This calls for a viable grain, with sound undamaged kernels. Dead and damaged kernels may give rise to mould development in the malting process and result in a poor quality extract. Germination should be at least 95 per cent.

On germination the proteins and the starch are modified and, this is an important point when the grain becomes malt, the brewer must be assured of an economic amount of water-extractable material. In order to achieve this, the grain must be high in starch and low in protein. A protein content of 9 per cent. or less at 13½ per cent. moisture (10·3 per cent. moisture-free) is generally sought, although maltsters will, of course, go above this level if sufficient grain of lower protein is not available. However, when the grain exceeds 10 per cent. protein (11½ per cent. moisture-free) maltsters look upon it with disfavour.

Apart from the physical characteristics mentioned earlier as being common to all quality barley, malting barley should consist of very plump grain with a thin, finely wrinkled skin and should have a white, mealy appearance when cut. This latter appearance denotes a low protein content.

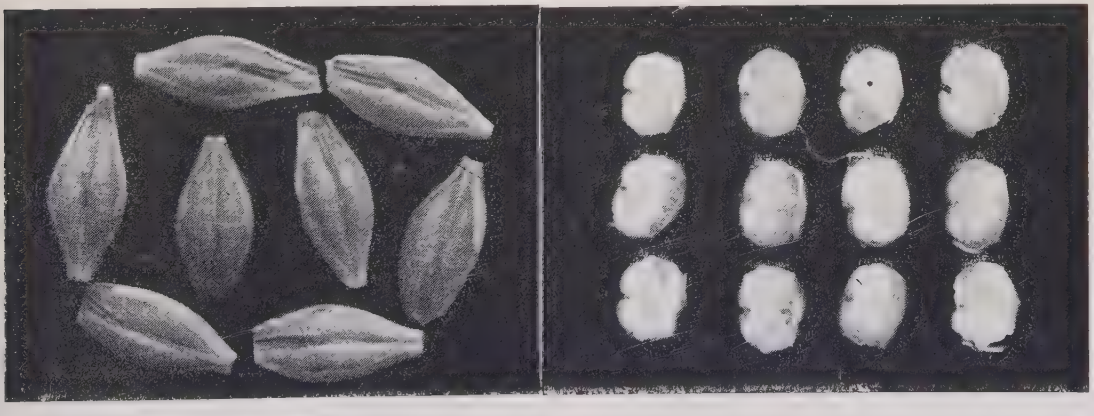


Plate 2

Distilling Barley and Cross Section.

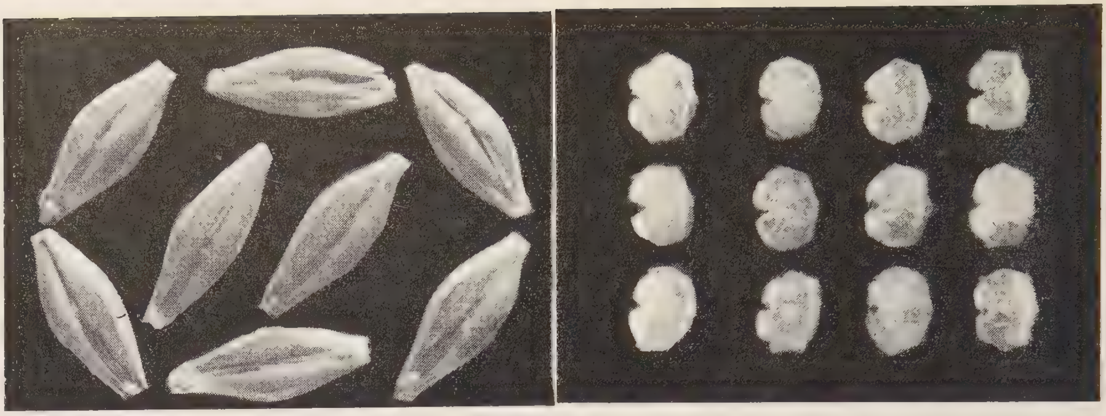


Plate 3
Milling Barley and Cross Section.

Plate 1 shows several grains of high grade malting barley enlarged to show the plumpness and fine wrinkling of the skin and (at right) the same grain in cross section, clearly illustrating the white mealy appearance. The protein content of this sample was 8·8 per cent. whilst the 1,000 kernel weight was 49·7 grams and the bushel weight 56 lb.

Distilling—The requirements for distilling are virtually the same as those for malting, and low protein is sought, but there is generally somewhat more latitude as far as our overseas buyers are concerned on the question of maximum protein. Queensland barleys of around 10 per cent. protein (11½ per cent. moisture-free) have been freely accepted by overseas distillers in recent years and some sales of grain have been made for this purpose even around 11·0 per cent. protein (12·7 per cent. moisture-free), although this must be regarded as rather too high to be generally acceptable.

Plate 2 shows grains, whole and in cross section, of a type suitable for distilling. It will be seen from Plate 2 that the skin is not quite so thin or finely wrinkled as the grain shown in Plate 1, whilst the cross section photograph shows a more vitreous (glassy) appearance denoting a higher protein content. The protein content of this sample was a little over 10 per cent., the 1,000 kernel weight 42·0 grams, and the bushel weight 57½ lb.

Milling—Milling grain is quite different in its chemical requirements from either malting or distilling. Firstly, germination is not importan since the grain is used for human consumptio and is not malted. Damage to the grain shoul still be at a minimum as a high proportion o broken or cracked grains results in milling loss A small amount of tipping or skinning of th grain is acceptable.

It is in the protein content that the require ments differ most markedly from malting barley Here the reverse—a high protein—is required A protein content of 11·0 per cent. (12·7 pe cent. moisture-free) and higher is much sough after.

In appearance the grain looks harder an tends to a smooth rather than a wrinkled skin.

Plate 3 shows milling barley, whole and i cross section, and the smooth skin and vitreou appearance of the grain are apparent. Th protein content of this sample was 13·6 per cent. the 1,000 kernel weight 43·6 grams, and th bushel weight 57 lb.

Feed—The main requirement of the fee grade is that it should not contain any pro hibited seeds or other matter which might b injurious to stock. However, under the Agri cultural Standards (Stock Food) Regulations maximum limits are imposed in relation to th presence of weed seeds, other grains and foreig matter. Generally feed grain tends to be thinne and less even than the other categories and i is usually characterised by low bushel and 1,00 kernel weights. Plate 4 shows this grain wit

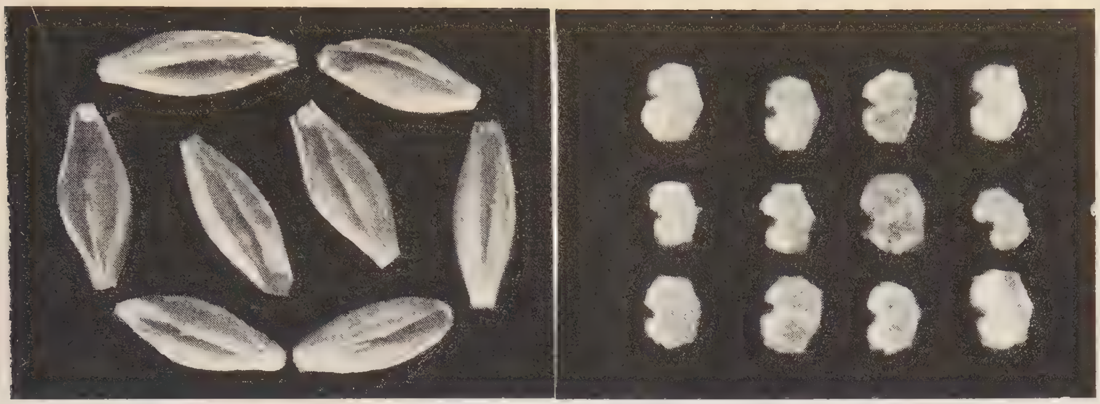


Plate 4

Feed Barley and Cross Section.

a protein content of 13·1 per cent., 1,000 kernel weight of 40·0 grams and a bushel weight of 53¼ lb.

Factors Affecting Quality

The main factors affecting barley quality are—

1. The variety
2. Climate, season and time of planting
3. Soil fertility
4. Cleanliness in cultivation
5. Harvesting methods

The variety Prior, which is extensively grown at present, is a good all-round variety under Queensland conditions. When environment is suitable it produces a good, low protein, malting barley. In a different environment, particularly on soils of high fertility, it is also capable of producing a very high protein grain which is eminently suitable for milling.

Its growing properties are generally suitable for Queensland conditions, and it has a satisfactory straw and threshes out well, if care is exercised in harvesting.

Under favourable seasonal conditions the variety produces a fairly large, plump grain which is an advantage for malting, milling and distilling.

Barley is extensively grown throughout the world, particularly in temperate climates, which are for the most part favourable for the production of grain of high malting quality. Under Queensland's variable climatic conditions the quality outturn of the harvest is always a little uncertain. Attention to those aspects of cultivation, harvesting and handling which affect quality will at least ensure that the maximum quantities of quality grain will be available in any season.

Soil fertility in the main producing areas is generally high, but is sufficiently varied to enable the production of barley of each of the three desired qualities. This factor, if understood and properly used, should enable us to take full advantage of the various markets for the different qualities of grain. The section dealing with chemical surveys outlines the steps which are now being taken to ensure that this advantage may be exploited.

The desirability of cleanliness in cultivation is common to all grain crops, but nowhere is it more important than in the case of barley. Samples containing more than a minimum of weed seeds and other foreign matter are unacceptable in the quality grades and must be sold as feed.

Harvesting methods are important, particularly in the case of malting and distilling barley. As indicated earlier, grain which has been badly skinned, cracked or broken will not germinate and consequently is unsaleable for these purposes. Careful adjustment of harvesting machinery and attention to harvesting speed will largely eliminate these troubles, which are a constant source of heavy loss to farmers. Excessive harvesting speed should be avoided wherever possible.

Plate 5 shows in enlarged size some of the main types of damage caused by faulty harvesting. A grain which has been well harvested is shown in the centre for comparison.

Chemical Surveys

In order to obtain accurate information on the quality of the Queensland crop and to provide data on the range and average of protein which may be expected in the various production areas, a chemical survey of the 1958 harvest has been undertaken. Samples drawn by the Barley Marketing Board have been analysed at the Agriculture Department's Chemical Laboratory and the preliminary results of this analysis are set out in the following paragraphs and tables. Plate 6 shows the areas and depots covered by the survey and indicates the average protein for each depot.

A major feature which is brought out by this analysis is the wide range in the protein content at many depots and the lack of any major differences for the season in the relative levels of average protein, as between the five districts used in the analysis.

Table 1 shows, in summary form, the protein ranges and district average protein of barley for the 1958 harvest, compared with the district average protein of wheat for the same harvest and for a longer term average.

TABLE 1

PROTEIN RANGE AND DISTRICT AVERAGE PROTEIN OF BARLEY 1958 HARVEST, COMPARED WITH DISTRICT AVERAGE PROTEIN OF WHEAT 1958 HARVEST AND 1950–1955 HARVESTS

District	Barley 1958 Harvest		Wheat	
	Range in Samples Tested	District Average	District Average 1958 Harvest	District Average 1950–55 Harvests
	Per cent.	Per cent.	Per cent.	Per cent.
1. Dalby	8·2–13·4	10·5	12·8	12·6
2. North Downs and Upper Central Downs	8·4–13·7	10·6	12·6	12·3
3. Lower Central Downs ..	8·7–13·6	10·8	12·7	11·9
4. Upper Southern Downs ..	7·5–14·1	10·2	12·3	11·6
5. Lower Southern Downs ..	8·9–11·8	10·9	12·5	11·5

It will be seen that the average protein content of barley for the 1958 harvest shows no great variation as between districts. Only 0·7 per cent. separates the Upper Southern Downs, which recorded the lowest average, from the Lower Southern Downs, which recorded the highest average.

A comparison with wheat protein figures for the 1958 harvest and the longer term 1950-55 average, however, indicates that this situation is somewhat abnormal. Wheat protein figures for 1958 also showed little variation as between districts, the maximum difference being only 0·5 per cent. However, the normal picture as shown by the 1950-55 averages is for a difference in average wheat protein of more than 1 per cent., with the highest level in the Dalby district ranging down to the lowest level on the Lower Southern Downs. It seems reasonable to expect that barley protein levels might on the average follow a similar pattern.

The position in regard to individual depots is somewhat different and these show quite substantial variations in depot average protein. Despite the known high overall level of protein content for this 1958 crop the average of depots such as Aubigny (9·6 per cent.), Allora (9·5 per cent.) and Goomburra (9.4 per cent.) is relatively low, whilst Millmerran (12·2 per cent.) is very high.

Of the 32 depots for which analyses were carried out 1 had an average protein of between 9 and 9·4 per cent., 2 between 9·5 and 9·9 per

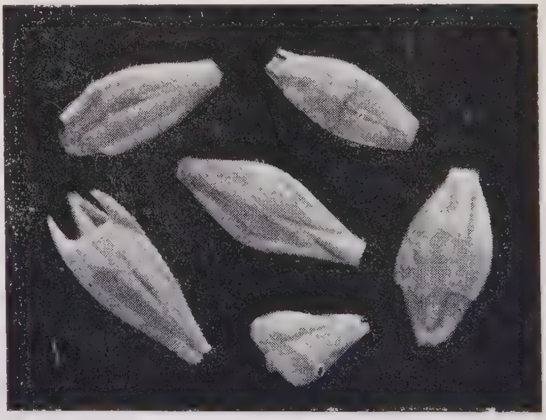


Plate 5

Main Types of Damage Caused by Faulty Harvesting.

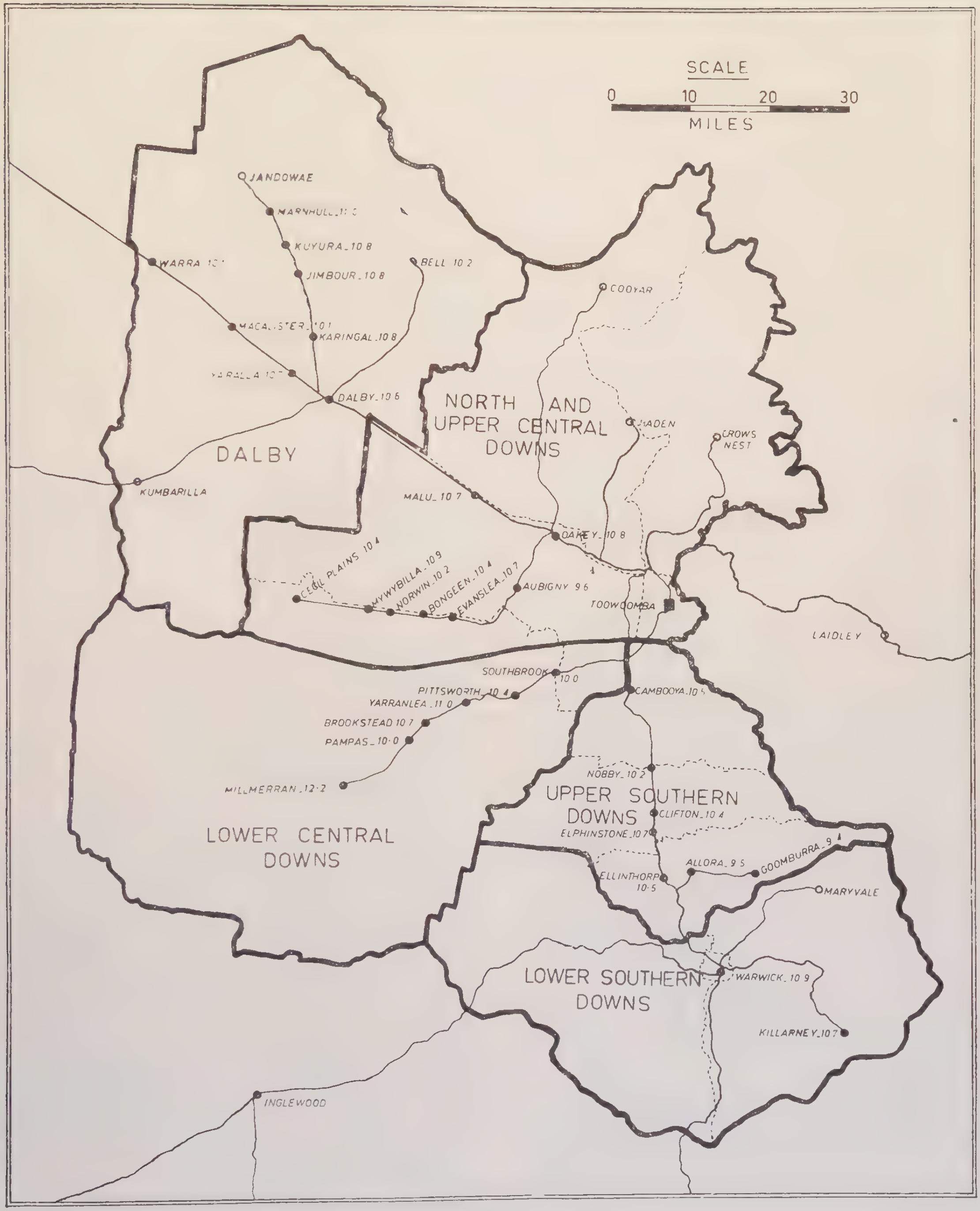

SCALE
0
10
20
30
MILES
JANDOWAE
MARNHULL_11 0
KUYURA_10 8
WARRA 10
JIMBOUR_10 8
BELL 10 2
MACALISTER_10 1
KARINGAL_10 8
YARALLA 10 7
DALBY_10 6
DALBY
KUMBARILLA
NORTH AND
UPPER CENTRAL
DOWNS
COOYAR
HADEN
CROWS
NEST
MALU_10 7
OAKEY_10 8
CECIL PLAINS 10 4
MYWYBILLA_10 9
NORWIN_10 2
BONGEEN_10 4
EVANSLEA_10 7
AUBIGNY 9 6
TOOWOOMBA
LAIDLEY
SOUTHBROOK
10 0
PITTSWORTH_10 4
YARRANLEA_11 0
BROOKSTEAD 10 7
PAMPAS_10·0
MILLMERRAN_12·2
CAMBOOYA_10 5
NOBBY_10 2
UPPER SOUTHERN
DOWNS
CLIFTON_10 4
ELPHINSTONE_10 7
LOWER CENTRAL
DOWNS
ALLORA_9 5
GOOMBURRA_9 4
ELLINTHORP
10·5
MARYVALE
LOWER SOUTHERN
DOWNS
WARWICK_10 9
KILLARNEY_10 7
INGLEWOOD

Plate 6

Barley Areas and Depots, Showing the Average Protein for Each Depot.

cent., 11 between 10·4 and 10·4 per cent., 15 between 10·5 and 10·9 per cent., and 3 over 11 per cent.

At the same time, 15 or nearly half of the 32 depots recorded some samples with protein content below 9 per cent., whilst 15 depots showed a maximum of over 12 per cent.

TABLE 2

PROTEIN CONTENT (N x 6·25 AT 13·5 PER CENT. WATER) 1958 HARVEST

AVERAGE PROTEIN CONTENT AND PROTEIN RANGE RECORDED BY DISTRICTS AND DEPOTS

District and Depot	Average Protein	Protein Range*
	Per cent.	Per cent.
1. *Dalby*—		
Bell	10·2	8·5–13·4
Dalby	10·6	8·7–13·0
Jimbour	10·8	10·0–11·8
Karingal	10·8	9·4–11·4
Kuyura	10·8	8·6–10·8
Macalister	10·1	8·2–11·2
Marnhull	11·0	11·6–12·9
Warra	10·1	9·8–13·1
Yaralla	10·7	Not available
2. *North Downs and Upper Central Downs*—		
Aubigny	9·6	8·8–11·1
Bongeen	10·4	10·8–13·7
Cecil Plains	10·4	8·8–10·6
Evanslea	10·7	Not available
Malu	10·7	10·4–13·5
Mywybilla	10·9	9·8–13·1
Norwin	10·2	8·4–12·6
Oakey	10·8	9·7–13·1
3. *Lower Central Downs*—		
Brookstead	10·7	9·1–11·8
Millmerran	12·2	8·8–13·6
Pampas	10·0	8·9–12·3
Pittsworth	10·4	8·7–12·7
Southbrook	10·0	Not available
Yarranlea	11·0	9·1–11·7
4. *Upper Southern Downs*—		
Allora	9·5	7·5–9·5
Cambooya	10·5	9·4–14·1
Clifton	10·4	8·3–13·2
Ellinthorp	10·5	9·1–11·8
Elphinstone	10·7	Not available
Goomburra	9·4	8·1–9·2
Nobby	10·2	8·7–12·3
5. *Lower Southern Downs*—		
Killarney	10·7	8·9–9·7
Warwick	10·9	10·6–11·8

* Range given by analysis of five growers' samples from each depot.

A detailed listing of average protein contents and protein ranges by depots is given in Table 2.

Since the question of barley quality is so closely related to protein content it is of interest to see the total and relative effects of the production of barley and wheat, in terms of removal of nitrogen from the soil. Table 3 provides a comparison between such losses for wheat and barley for the 1958 harvest.

TABLE 3

REMOVAL OF NITROGEN FROM SOIL IN THE FORM OF GRAIN FOR BARLEY AND WHEAT DURING THE 1958 HARVEST

District	Nitrogen loss in lb./acre	
	Barley	Wheat
1. Dalby	33·0	36·6
2. North Downs and Upper Central Downs	33·4	34·8
3. Lower Central Downs ..	31·4	31·3
4. Upper Southern Downs ..	28·0	27·1
5. Lower Southern Downs ..	24·8	24·4

Barley has now become an important crop in Queensland. With the 1958 crop worth nearly £4,000,000 and export income from the crop amounting to £3,500,000, big financial gains are possible even from small increases in the price.

Any efforts directed toward providing markets with grain of a quality best suited to their individual requirements are likely to reap a substantial cash reward in terms of returns to growers. On the other hand, failure to pay attention to quality could well result in reduced markets and will certainly result in lower prices.

Present marketing and chemical research is designed to provide a starting point for such efforts. It will, of course, be some years before the quality picture is definitely established, but in the meantime the initial results should assist those associated with the marketing of the crop in meeting market demands.

A Low Cost Refrigerator For Milk Or Cream

By **D. C. KEATING, Dairy Adviser**

This refrigerator was designed to reduce the capital outlay of milk producers who have to store milk overnight on their farms.

Cooling of milk and cream on the farm can be the answer to a farmer's quality problems thereby increasing the financial returns for his product. The consistent high quality obtained in milk stored in an underground concrete refrigerator cabinet on the property of Mr. P. St. Ledger of Bonna, near Bundaberg, has proved the value of cold temperature storage.

Farm trials on milk refrigeration commenced by the Department in 1958 and reported in the *Queensland Agricultural Journal* in February, 1959, have shown that an "in-tank" refrigerator unit can be used with success in a farm-built cabinet or tank. The cost of the complete unit is considerably lower than commercial dairy cabinet-type refrigerator units.

As market milk is collected only once daily in this area, refrigeration is the only means whereby milk held overnight can be guaranteed to meet the quality requirements for the market milk trade.

This unit was constructed and ready for use in February, 1958. Although the operation is similar to the in-tank units, the refrigeration plant resembles that used in immersion-type units. Storage space for four 10 gal. cans was provided in this cabinet.

Layout

The cooling cabinet is situated in the milk room adjacent to the wall separating the milking shed from the milk room. This layout permits

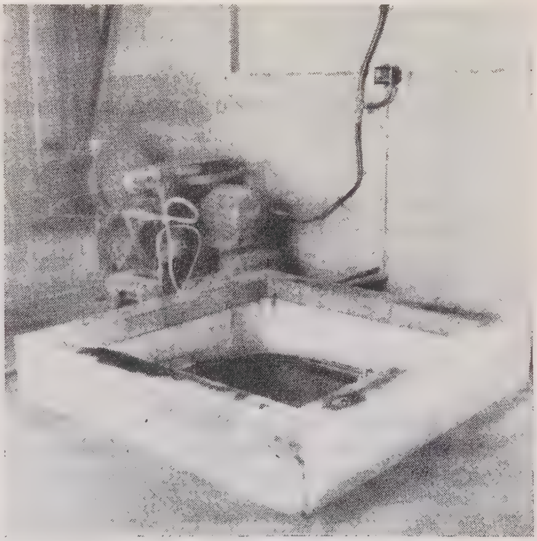


Plate 1

Refrigeration Unit and Concrete Tank for "In-Tank" Cooling of Milk. Note the positioning of the copper cooling coil around the walls of the pit.

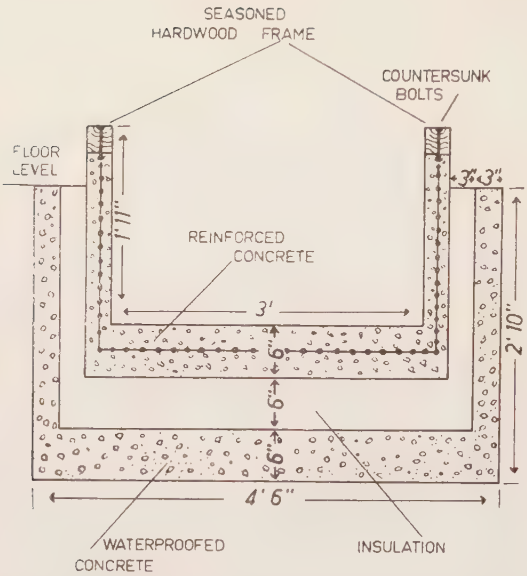


Plate 2

Elevation Plan of Underground Tank, Showing Inner and Outer Concrete Cabinets with Separating Insulation Material.

pulley blocks and track to be installed to carry the milk outside the door to a waiting vehicle.

The electric motor, compressor and fittings are situated at floor level, beside the underground cabinet.

The layout of the electric motor, compressor, and fittings is shown in Plate 1.

Construction of the Cabinet

The cabinet consists of two concrete walls and floors separated by a layer of insulating material (Plate 2). Surfaces subject to heavy wear, such as the floor, were specifically strengthened.

The concrete mix consisted of a mixture of five parts river sand and gravel and one part of cement. Silicate of soda was added in order to prevent water seeping into the insulation from the tank and surrounding earth.

These steps were followed in constructing the unit:

(1) A hole 2 ft. 10 in. deep and 4 ft. 6 in. was excavated through the existing concrete floor and underlying earth.

(2) A layer of 6 in. concrete was poured on to the floor of this hole. Vertical boxing of pine was then placed on top of this cement floor. This boxing was squared off and a space of 3 in. allowed between the box and earth sides of the hole.

(3) Concrete was then poured into this space and tamped. Particular attention was given to tamping against the sides of the box to give a smooth and more watertight finish. This space was filled to within 1 in. of the dairy floor level, left rough and allowed to set. The boxing was removed when the cement hardened. To enable this boxing to be removed easily, two sides were sawn through with level cuts and held in place with pine strips. When the pine strips were removed, two sides folded inwards and were removed. The other two sides could then be easily removed from the hardened wall.

(4) Six inches of insulating material were then laid on the floor of this concrete well. The insulation used was a mixture of sawdust saturated with tar and some granulated cork obtained from a dismantled hot water tank at the Bundaberg Butter Factory.

(5) The inner walls and floor of the cabinet were laid in one piece, with ¼-in. iron rods as reinforcement.

The outside boxing for this inner wall was placed in position to allow a 3-in. space between the inner and outer walls. The boxing was squared off and braced to the floor.

The reinforcement rods were bent into a U shape to lie down one side, along the bottom and up the other side. These provided vertical rod reinforcement on all sides and a squared pattern on the floor bottom. Other rods circled the uprights horizontally and were tied in position with tie wire. The reinforcement, when completed, resembled a steel crate of 4 in. mesh open at the top. The reinforcement was supported 3 in. above the insulation on the floor and 1½ in. from each side of the wall boxing.

(6) Six inches of concrete were laid on the floor and smooth-finished with a slight slope to one corner. The inner box was then placed into position and squared off at 3 in. from the outer box on all sides. Both these boxings extended 3 in. above floor level.

(7) Concrete was poured between these boxings, ensuring that the cement packed tightly about the reinforcement. The cement was brought to the top of the boxings and smooth finished. Eight ½ in. bolts were set in the top of this wall, two bolts projecting 4 in. upwards on each side.

(8) When the concrete was firm but still green, all boxings were removed. The inner surfaces of the wall were scratched to provide a rough surface for plastering. The spaces between the inner and outer walls were filled with insulation to within 2 in. of floor level and tightly rammed. The space above this insulation and the outer wall was then sealed with concrete and smooth-finished at floor level.

(9) A plaster mixture of two and a half parts of $\frac{1}{16}$-in. screened sand and one part of cement was then used to provide a smooth surface on the exposed sides of the inner wall.

(10) A frame of 4 in. x 2½ in. seasoned hardwood was bolted to the top of the inner wall. The corners of this frame were half-checked. A lid was constructed of ⅝ in. bondwood on a beech frame to prevent warping. Heavy insulation in the lid was not provided. Cold air tends to fall to the lower stratas and loss of refrigeration due to convection is not great in the upper portions of the cabinet. This lid was painted with a gloss finish paint as protection against damage by condensation.

Costs

(a) *Cabinet*

Costs to construct this cabinet were:

	£	s.	d.
1½ cubic yards sand and gravel	1	15	0
Lid	5	0	0
5 bags cement @ 14s.	3	10	0
Silicate of soda		12	0
Reinforcement	3	6	0
Hardwood frame		16	0
Labour and boxing	12	0	0
Total	26	19	0

This cost represents a cash outlay, and does not include the farmer's labour charges during construction. This cash outlay could be reduced if a producer were able to provide the sand and gravel. Further, good quality seasoned hardwood timber can be found on most farms and with suitable dressing could be used.

To reduce the time required for plastering, it is possible to construct boxings with smooth lining (for example, three-ply well braced) and use sand with gravel not larger than ¼ in. With good pouring and tamping, a smooth inner surface would be obtained and no plastering required.

In some instances reinforcement rods can be purchased second-hand. Business houses in towns often receive crockery packed in iron rod crates of 3 in. mesh. These can be purchased for £1 and are excellent reinforcement for the inner wall and so reduce the cost of reinforcement.

(b) *Refrigeration*

Costs of refrigeration plant were:

	£	s.	d.
1 h.p. electric motor and starter	36	10	0
½ h.p. compressor (reconditioned)	65	0	0
Copper coil, valve and legs	39	2	2
Thermostat	5	12	0
Milk cooler and hoses	27	0	0
½-inch water pump	9	0	0
Pulleys, belts and fittings	4	18	1
Electrical installation	5	0	0
Refrigeration installation	9	10	0
Total	201	12	3

The compressor used was of ½ h.p. rating and purchased as a reconditioned unit. This was available from an ice cream company who were changing over to sealed units in commercial refrigeration plants. The equivalent price for new equipment embracing a similar compressor, copper coil and hand valves, electric drive, thermostat is £160.

It would be difficult to reduce this cost where motive power is electricity. Where a milking machine fuel engine is used, the motor, thermostat and electrical installation would not be required.

Where electricity is available, this equipment is necessary for efficient operation.

It is considered that some reduction could be made in the amount of copper coil used. In this unit, the copper coil encircles the cabinet, but this could be reduced by having the coil against an end and across the centre of the cabinet. Cans would then be stored on either side of the copper tubing across the centre.

The thermostat controls the working of the refrigerator plant, and, in this case, the motor cuts in and applies refrigeration when the temperature of the water rises to 37 deg F. and cuts out when the temperature is reduced to 35 deg. F.

(*c*) *Operating Costs*

Unfortunately, this plant is not connected to a separate meter to obtain accurate costs of power. However, it has been estimated from observations of running time that this cost would approximate £6 10s. a quarter. Both night and morning milk are cooled, which would tend to increase this running cost. Total cooling and storage costs obtained in the Departmental tests were of the order of ½d. to ¾d. a gallon.

During 17 months' operation, from February, 1958, to July, 1959, no maintenance costs have been incurred by this plant. Milk quality results during this period were good, only one sample of milk decolouring the methylene blue test in less than four hours. A summary of temperature recordings taken during summer months showed—

Milk in Holding Vat	Milk off Cooler	Milk on arrival at Factory
91°F	50°F	45°F

CHANGING THE WATER

Sufficient water should be used in the cabinet to reach to the shoulders of the cans of milk. This is necessary to ensure optimum transfer of refrigeration. This water requires regular changing, to avoid contamination of the milk.

To change the water, disconnect the delivery hose from the cooler, start the water pump and pump the water to waste by way of the dairy drain.

A small amount of soda ash could be added to the water to reduce acidity and thus minimise rusting on the outsides of the cans. However, there is no evidence of rusting on cans in the existing cabinet and it is thought that the cement walls and floor have supplied sufficient salts to reduce acidity in the water.

While appreciating the high costs involved in electrical refrigeration equipment installation, the entire unit compares favourably with refrigerators at present on the market.

The feature of this unit is the low cost of the cement underground cabinet, which would be very suitable for adaption to in-tank cooling.

Acknowledgement is made to Mr. St. Ledger for his co-operation, and Mr. E. G. Parsloe, Manager, Port Curtis Co-operative Dairy Association, Bundaberg, for his guidance and asistance in the construction of the cabinet.

Watch for Leptospirosis

Be on guard to detect outbreaks of calf redwater or leptospirosis from now until the end of the wet season. Outbreaks of this usually fatal bacterial disease are most frequent in the wet season, although they can occur at any time.

Cows also become infected, but not so severely as calves. Leptospirosis is highly infective and is transmitted by contact between calves, inhalation or simply through skin abrasions. The disease can be transmitted to man. Pigs or carrier calves are the chief source of infection.

Calves with the disease quickly become fevered, drip saliva from their mouths and breathe heavily. The appetite disappears and if the animals live long enough, anaemia and jaundice follow. Immediate treatment with antibiotics can give good results, but it's better to have your calves vaccinated. The cost is about 2s. a calf.

—*R. JOHNSON, Veterinary Officer.*

stock and station

Little Danger In Treated Fence Posts.—There's little danger of cattle being poisoned through licking or chewing fence posts treated with any of the common preservatives. But it would be dangerous to let stock have access to stacks of freshly treated timber or to ground contaminated with run-off from treated posts.

The practice of using chemically-treated saplings instead of heartwood for fence posts is growing, both in Australia and overseas. Studies in New Zealand on the risk of stock poisoning from treated posts showed that the danger is negligible when creosote, PCP or special arsenical preservatives are used. Arsenical compounds for preserving fence posts are not ordinary weed-killers or dip preparations which are extremely toxic to cattle.

The New Zealand experiments showed that it would be impossible for cattle to chew and swallow sufficient treated wood to cause poisoning.

—D. N. SUTHERLAND,
Director of Cattle Husbandry.

Buy Hay Now?—Throughout the State many pastures are rapidly reaching maturity. This means a steep drop in quality and productivity. Unless autumn weather conditions are more favourable than usual we are likely to face a long period of poor quality pasture before the spring rain.

Should you consider that your fodder reserves are not sufficient there is still time to remedy the matter if you have access to lucerne-growing districts. Hay is available cheaply if you act now.

The lucerne hay to which I refer is not prime quality, being rather grassy, but it's a valuable feed at the current price of about £8 a ton. Avoid mouldy hay and purchase only hay that is properly cured.

Lucerne hay is probably the most useful of all conserved fodders for cattle. In baled form it is easy to handle and store. It is readily transported over a property and can be fed out on clean ground if necessary. Further, you are bringing fertility on to your property.

For dairy cattle 10 tons of lucerne hay will maintain a 20-cow herd for 3 months. That is about 3 cwt. of hay for each cow for one month.

In the case of beef cattle, 1½ cwt. for each cow monthly is a worthwhile supplement to dry pasture. For beef weaners a 10-ton truck of hay would supply enough supplementary feed for 200–250 head for a month.

—W. F. MAWSON,
Senior Adviser in Cattle Husbandry.

Precautions For Sheepmen.—Some problems in sheep areas of the State that intensify with the season's change are: Bush fire risk; increasing water evaporation; wind and storm danger to windmills, homesteads and buildings; possibility of flood rains.

Adequate fire ploughing, preparation of fire-fighting equipment, stock and fence insurance all need full consideration.

The increasing water evaporation could call for extension of suction piping in excavated tanks, and regular patrolling of open waters to carry out early rescue of bogged sheep.

Checking and tightening any looseness in windmill structures, and repairs to weak spots on roofs will put you ahead of wind squalls.

To keep ahead of flood danger, move sheep from river channels and frontages; put flood gates in order, and lift or drop netting, to allow the passage of debris, branches, and rubbish. Rations, drenches, insecticides, and materials should be in adequate supply to allow for periods of possible flood isolation.

—*R. B. YOUNG,*
Senior Adviser, Sheep and Wool.

Mange Cuts Pig Profits.—Mangy pigs are unprofitable; they grow more slowly than healthy ones and will even lose weight if you don't treat them.

Mange outbreaks are common in Queensland piggeries. You'll recognise the disease fairly readily as the pigs rub constantly, their skins become dry and scaly and the hair may fall out. If you suspect mange in your piggery, ask your local adviser in pig raising to take skin scrapings for examination.

Mange can be cured quickly if you start treatment before the pigs become badly affected. Use a BHC spray or dip containing 0.22 per cent. of the gamma isomer, and wet each pig thoroughly, including the head. Then crowd the pigs together in a small pen for a few minutes so that the preparation will be rubbed into their skins. Repeat the treatment at 10-day intervals until the mange is cured.

—*T. ABELL,*
Senior Adviser, Pig Branch.

New Facts On Debeaking.—Debeaking fowls to curb feather picking and cannibalism and to reduce food wastage is a practice that seems to be here to stay. It's like dehorning cattle to stop goring and to obtain the most efficient use of forage.

New information on debeaking has come from trials at the Rocklea Animal Husbandry Research Farm.

Growth rates showed that it did not matter greatly whether fowls were debeaked at day old or week old. Another trial compared the merits of an electric debeaking machine and a pair of nail clippers. It was found that the nail clippers were quite satisfactory and quick. There appeared to be no advantage in block debeaking, that is removing parts of both beaks. Block debeaking was slower than single debeaking and did not result in any greater saving in food.

—*F. N. J. MILNE,*
Senior Poultry Husbandry Officer.

Keep Your Pigs Cool In Summer

There is no doubt that pigs are more contented and grow faster in temperatures between 60 and 75 deg. When summer temperatures stay up much beyond 7 deg., pigs quickly react in a manner costly to the farmer—they stop growing.

Pigs kept in temperatures of 90 deg. or over make little or no growth.

Unfortunately that is not the only effect hot weather has on our pigs. Experiments have shown that, where it took only 4 lb. of feed to produce 1 lb. of liveweight gain in baconers kept at 60 deg., nearly three times as much feed was required for 1 lb. of gain at just under 90 deg. in experiments.

For many pig farmers in the hotter parts of Queensland this is a very likely source of both waste of feed and loss of profit. The obvious prevention is to keep your pigs cool in summer.

Why not start by checking the temperature in your pig sheds? All you need do is fasten a thermometer inside on a wall, about 2 ft. from the floor. Protect it so the pigs can't damage it. Then note the temperature at intervals during a hot day.

If you find that the shed temperature exceeds 80 deg. for some hours, you would be wise to alter the shed so it will be cooler.

—*T. ABELL, Senior Adviser, Pig Branch.*

The Fight Against Disease—V.

How Immunization Works

By G. C. Simmons, Senior Bacteriologist.

In this article the artificial means of obtaining immunity from infectious disease is discussed.

The greatest contribution made to human welfare by the science of microbiology is the germ theory of disease. This theory not only made clear the spread and occurrence of many diseases but also led the way to the understanding of one particular aspect of disease which had been noted for centuries. This was the immunity that followed after an attack and subsequent recovery from infection.

As each infectious disease is caused by a specific micro-organism, so past generations had recognised that immunity was also specific. For instance, a child is immune to mumps following an attack of that disease but is still susceptible to other diseases such as measles. This specificity or distinctness is very important when vaccination is under consideration.

The period of immunity following recovery from an infectious disease varies greatly. It may last a week or so, or it may last a lifetime. Usually, immunity gradually decreases with time so that eventually the animal may be susceptible and suffer another illness, which is often less severe than the first one.

Why not more Vaccines?

Theoretically, it should be possible to immunize against all infectious diseases. Why then are so few vaccines used?

Two main reasons are the difficulty in preparing suitable vaccines and the poor economic gain from using the vaccine.

The first point is one on which research workers are continually working, for loss from some important diseases such as staphylococcal mastitis would be greatly reduced if efficient vaccines were available.

The second reason requires explanation in more detail. For a vaccine to be of value, the cost of the vaccine and its application must be recouped in increased production by preventing wastage from lowered production and mortality. Seldom can one foresee which animals will become affected, therefore in veterinary medicine it is the rule rather than exception to vaccinate all animals in a herd or flock.

However, many diseases occur sporadically, that is, only one or two animals in a herd may become infected over a year or so. To prevent these sporadic cases, whole herd vaccinations would be necessary, possible at quite frequent intervals. In this case, the actual cost of vaccination may be greater than the loss from death or lowered production.

Vaccination of very valuable animals only may be warranted in some cases.

The cost of a vaccine includes not only the actual cost of producing the vaccine but also the research and development necessary to bring it to a state for production. There must, therefore, be a large demand before manufacturers will consider making a vaccine, for then initial developmental costs can be spread over a large number of doses. Hence no immunizing agents are available for diseases that are rare or sporadic.

Another point is that closely related pathogens may cause similar diseases, for example, Salmonella cause salmonellosis, but different

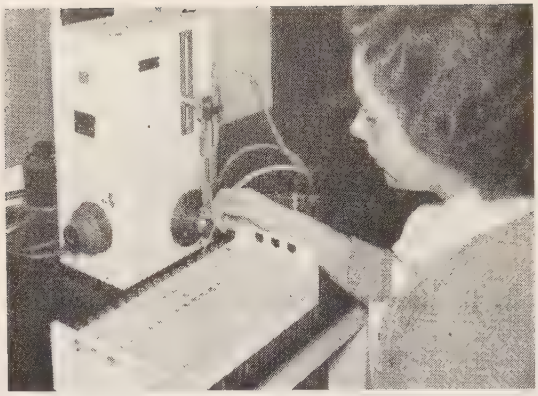


Plate 1

Pipetting Serum at the Department of Agriculture and Stock's microbiological laboratory at Yeerongpilly.

strains may differ just enough for immunity to one species not to be effective against a different species. There are now, for instance, over 300 recognised species of Salmonella. The cost of preparing a vaccine to cover a range such as this would be prohibitive. Sometimes, however, only a few strains may cause a majority of infections in an area and a vaccine can be made to include these main species. Another point to consider is whether the vaccine will be of value in future years. Some micro-organisms, particularly viruses, have the ability to change their characteristics so that immunity from their attack may be upset.

ARTIFICIAL IMMUNIZATION

Some animals have an innate resistance to infectious diseases but most animals must obtain immunity. This may be done naturally or artificially.

There are two ways in which immunity may be artificially produced—by injecting antiserum which gives what is called "passive" immunity or by immunization with a vaccine to produce what is called "active" immunity. Both antisera and vaccines are relatively fragile products made by highly skilled microbiologists. Their use should be on the advice of veterinarians who have knowledge of their value and are trained to carry out administration of them in the correct and approved manner.

Antiserum is used to give temporary protection when an animal has been exposed to infection. It is often used also to treat existing infections but as its action is against the pathogen or its products, antiserum will only be of value if it is used early in the disease before irreparable damage has been done to the animal's body tissues. This is one reason why early advice should be sought in any disease.

Antiserum is prepared by bleeding an animal recovered from a natural infection or by "actively" immunizing a normal, healthy animal artificially. When tests show that the blood serum of the immunized animal has sufficient numbers of protective substances known as antibodies, a large volume of serum is collected, sterilized, a preservative added and potency determined. It is then dispensed into suitable-size doses.

Antiserum is used in several diseases of veterinary medicine such as canine distemper. It is also important in preventing tetanus in animals accidentally wounded or following surgical technique such as castration.

Although each disease may have its own characteristic variety of immunity, there are two basic types of vaccines used. The vaccine may be living or it may be dead.

Living Immunizing Agents

Living vaccines are used particularly for virus diseases but even in this field, experience of the now famous Salk poliomyelitis vaccine has shown that *dead* viral vaccines may become more widely used.

Living vaccines may contain fully virulent organisms or may be made from strains which have been weakened so that they are no longer capable of producing severe disease.

One example of a fully virulent vaccine is contagious pustular dermatitis vaccine used to immunize sheep against scabby mouth. The application of this vaccine inside the thigh of a lamb produces an infection which does no harm but immunizes the lamb against more important infection on lips and muzzle. It is obvious that particular care should be taken in the use of such vaccines to prevent undue spread of the disease and that living vaccines of this type should only be used in areas where the disease is firmly established.

An example of an attenuated or weakened type of living vaccine is *Brucella abortus* St. 19 vaccine (Strain 19) which is so successful against contagious abortion of cattle. Here again, care should

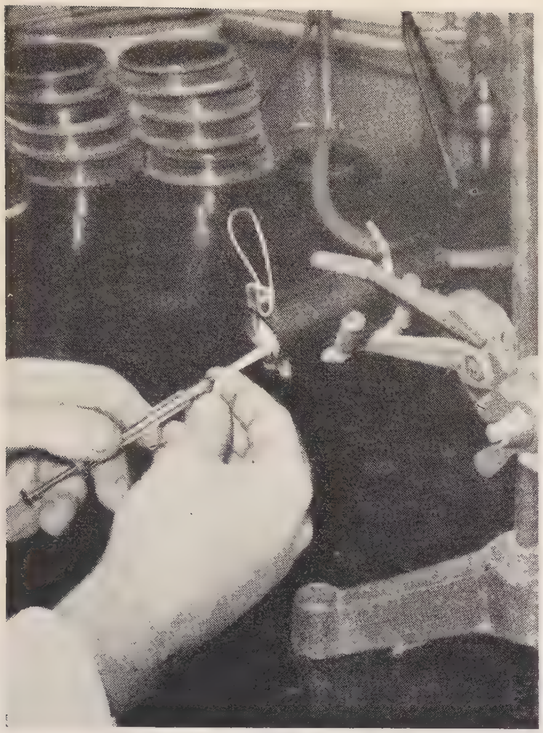


Plate 2

Carrying Out an Intravenous Injection of a Mouse.

be taken in handling the vaccine so that it is not scattered about and also to ensure that rough treatment does not kill the living organisms before use.

Dead Immunizing Agents

Dead immunizing agents are to be preferred, for there is no risk of spread of infection and a preserving agent can be added to keep the vaccine in a satisfactory condition.

The vaccine may consist of the cells of the micro-organism and its growth product or it may consist of the growth products only. Streptococcal vaccines for strangles in horses are carefully killed cultures of streptococci known to cause this disease, whereas tetanus vaccine, known as tetanus toxoid, contains the poison or toxin which is produced by the tetanus bacillus, but rendered non-toxic (not poisonous) by appropriate chemical treatment.

Step to Eradication

Immunizing agents can be used either for single animals or on a whole herd or flock basis. It is the latter use that is important in the control of infectious disease. Almost without exception, immunizing agents that are now marketed and sold as registered veterinary medicines will be effective if used correctly.

Progressive thought on animal disease must include the aim of eventual eradication. Sometimes this is impossible under existing circumstances and hygiene and immunization are the only means of control. However, with some diseases, eradication would be possible if concerted effort is made. In each eradication campaign, vaccination may play an essential part in the initial stage.

Strain 19 vaccine for contagious abortion when used for a number of years in a herd should eventually produce a resistant herd with few, if any, carriers of *Brucella abortus*. If cattle in whole areas can be immunized, eventually it may be possible to so decrease infection that vaccination may be stopped and a policy of eradication adopted. Vaccines will not eradicate a disease, but if handled intelligently may be used in the eventual realization of this most desirable goal.

Use Weedicides In Moist Soil

Pre-emergence weedicides are always more effective when applied to moist soil than when the soil is dry. In very dry weather, it's better to put off spraying until there's been some rain.

In any case, the more water you use in spraying, the better your chances of getting good weed control. PCP, CMU and similar preparations have to be taken into the soil to kill the weeds as they germinate.

To cover the soil completely, 100 gallons an acre is the minimum quantity you should put on. In fact, it's much better to put on 200 gallons for the sake of getting good penetration into the soil. When using the bigger quantity of water, the amount of weedicide need not be increased.

—*J. L. GROOM, Senior Agronomist.*

Eliminating Abortions And Stillbirths In Pigs

By K. B. HALE,
Veterinary Officer.

MUCH stress has been placed on pig losses occurring between birth and weaning. However, losses before or at birth are very important and can lead to great economic loss. You can eliminate this problem by attention to disease control and husbandry methods. This article deals with the major causes of abortions and stillbirths, and shows how they can be recognised and treated.

THE main causes of abortions and stillbirths in pigs are :

(1) Infectious disease.
(2) Dietary deficiences.

The most common infections causing abortions and stillbirths are:

(*a*) Swine brucellosis.
(*b*) Leptospirosis.

These two diseases are important not only in your pigs, but you can be infected with both of them yourself.

SWINE BRUCELLOSIS

Swine brucellosis was first described in Queensland in 1936 but undoubtedly was present some years before that. Since that date, the disease has been found in all the major pig raising areas of the State.

However, although the disease is State-wide, its incidence is very low. An example of this can be gathered from the fact that in 1957, of 1,743 samples submitted to the agglutination test, involving over 150 herds from all parts of Queensland, only six herds were found to be infected.

The disease in individual herds can, however, be very important, and is one which farmers cannot afford to neglect. Careful investigation has shown that it can reduce the average number of weaners to a sow to less than four piglets.

Swine brucellosis is caused by a germ *Brucella suis* related to, but distinct from, the germ *Brucella abortus* which causes contagious abortion in cattle.

Infection is contracted from contamination of food and water or by service. Since the germ is found in the urine, dung, aborted piglets, as well as membranes and discharge from infected pigs, it can be seen how easy food and water supplies can be heavily contaminated.

However, in spite of this, infection at service is the more important means of spread. The practice of lending boars or taking in sows for service cannot be too strongly condemned on these grounds alone.

Suckers can contract the disease from drinking the milk of infected sows. Most of these suckers throw off the infection but a few will harbour it.

Symptoms of Brucellosis

After infection, the germ is carried by means of the blood stream to all parts of the body, producing lesions where they become localized.

In the boar, this localization usually affects the testicles and seminal vesicles (internal sex organs). Therefore, swelling of one or both testicles in the boar leads one to suspect brucellosis. Because of the damage done to these organs, sterility of the boar may follow.

In sows, the organ where localization occurs is the uterus (womb). In pregnant sows, because each foetus is enclosed in a separate membrane all the piglets are not equally affected.

If the sow carries the piglets full time, some may be born alive and die shortly afterwards, some are fully developed and born dead while others are undeveloped. A very common feature is that new-born suckers die off in large numbers within a day or two of farrowing.

Often, however, abortion occurs early in pregnancy and since the sow eats the aborted material it may not be noticed. The only noticeable symptoms then are an unexpected return to service with or without a whitish discharge from the vagina which mats the bristles of the tail.

Briefly, therefore, symptoms suggestive of brucellosis are:—

(1) In boars—a swollen testicle.

(2) In sows—abortion, sudden return for service or birth of dead or weak piglets.

(3) Infertility which may be accompanied by a whitish discharge in the sow.

How Can You Check?

A laboratory test on blood samples helps to provide a check or diagnosis. Your veterinary officer or stock inspector can take the necessary samples quite easily.

About an ounce of blood is taken from the suspected animal. This sample is taken by firmly securing the pig with a nose rope and then puncturing the vein which runs along the undersurface of the tail. This is done with a sharp-pointed blade. The sample is allowed to clot and the serum (clear fluid) poured into a sterile bottle. This serum is forwarded to the laboratory.

Another site used is the ear vein. The pig is secured as before and the large vein at the base of the ear is severed with a sharp blade. Care must be taken that the ear is thoroughly clean and dry before this procedure, otherwise the sample may be worthless.

Bleeding from the tail is must more satisfactory once the simple technique has been mastered.

The test relies on the fact that in the serum of infected animals are substances called agglutinins, which react on a special substance made from the brucella bacteria to form clumps which collect in the bottom of the test tube. This clumping is called agglutinating and the test is known as an agglutination test.

There are some limitations to this test which may be summarized as follows:

(1) A few weeks after a pig contracts brucellosis its blood gives a positive reaction to the test. Most animals continue to give a positive reaction as long as infection remains in their bodies but in some the reaction becomes weaker (and so under suspicion) and later even negative although still infected. Sometimes, infected animals remain positive for only a short time (weeks or months).

(2) A suspicious reaction may be (*a*) an infected animal whose reaction is increasing from negative to positive, (*b*) an infected animal whose reaction is decreasing from positive to negative, (*c*) an uninfected animal.

(3) Therefore, a negative reaction in an infected herd is not definite evidence of freedom from the disease because—(*a*) the animal may only be recently infected, (*b*) the animal's reaction may be decreasing.

However, the test is very valuable in establishing infection on a herd basis. In *any* herd a positive reaction is definite evidence of infection.

Having once established the presence of the disease, this test is also useful in eradicating it. It has proved effective in this State and throughout the world.

Another way of establishing presence of the disease is to forward an aborted piglet to the laboratory for culturing the germ.

How is the Disease Controlled?

No effective treatment or vaccine for swine brucellosis has been found. However, it is possible and practical and desirable to eradicate the disease both from the economic point of view and your own health's sake.

The procedure recommended is one of quarantine, sanitation and blood testing. The procedure is outlined:

(1) Test all breeding sows and boars.

(2) Select weaners from negative sows with a good breeding history and isolate on clean ground at weaning time. Keep these in strict isolation.

(3) Sell all the old stock for slaughter as soon as marketable because of the risk of their carrying the disease to the isolated stock.

(4) Re-bleed the weaner replacements at weaning and subsequent regular intervals. Cull any reactors.

When selecting the isolation site, choose a clean pasture away from and receiving no drainage from the infected pens. If pens previously occupied by infected stock are used, clean with disinfectant (for example 5 per cent. lysol), expose to the sun and leave vacant for two months.

Protecting Brucellosis-free Herds

Introduction of infected stock must be guarded against.

1. Buy replacements from a brucellosis-tested herd.
2. Isolate and test any animal not certified.
3. Don't lend boars or take in sows for service.

This Department has a scheme whereby swine herds may be listed as brucellosis-tested herds. This scheme, begun in 1950, provides for the testing of stud herds until such times as they have passed two consecutive tests, 90 days apart, without any positive reactors being found. After this, re-tests are done annually.

Any introduced animal must come from a tested herd or the animal must be isolated and have two clean tests not less than 30 days apart before being allowed with the herd. When the herd has passed the prescribed tests, it is added to the list of tested herds and published in the *Queensland Agricultural Journal* each month. At present there are 96 such herds and the number is increasing. Much significance is placed on this certification and most agricultural shows will only accept exhibits from brucellosis-tested herds.

If you are a stud breeder, contact your local Department office with a view to having a tested herd. The work in testing is done free by Departmental officers.

LEPTOSPIROSIS

Leptospirosis is a highly infectious disease caused by a group of germs called *Leptospira.* The ones involved in abortions and stillbirths of pigs are *Leptospira Pomona* and *Leptospira hyos. Leptospira pomona,* by far the commoner of the two, is of special interest for Queenslanders in that it was first isolated in 1939 from samples taken from a human subject at Pomona, near Gympie. Since then it has been found to be world-wide in distribution.

In 1948, work performed by officers of the Department of Agriculture and Stock incriminated leptospirosal organisms as the cause of a severe, highly fatal, red-water of calves and isolated the germ from pigs on farms where the outbreaks in calves occurred. Circumstantial evidence pointed to leptospirosis as a potent cause of abortions and stillbirths in pigs. This led to experiments being performed at the Animal Research Institute, Yeerongpilly, in 1954. These experiments proved that leptospirosis can be a cause of abortions in swine.

Since these experiments, abortions due to leptospirosis have been seen throughout the State. It is much more common than brucellosis but because it shows no apparent symptoms in non-pregnant sows, little infertility and, except in recently infected herds, only sporadic abortions, its presence in a swine herd may go unheeded for a considerable time.

Pigs have been shown to pass large numbers of *Leptospira* in their urine for up to six months after infection. Although these are readily killed by sunlight they will survive in moist places.

Infection can therefore take place by contamination of food and water with infected urine, through infection of cuts and abrasions while wallowing, as well as by direct contact with infected urine. It may sometimes be introduced to a clean piggery by the urine of infected cattle.

Symptoms

When the disease is introduced to a previously free herd, there is little or no visible sign of ill-health. However, if pregnant sows become infected they may abort. Usually, if many pregnant sows are present an abortion "storm" is experienced (that is, nearly all the pregnant sows abort in a short period of time).

Due to the long duration of *Leptospira* in pigs, the disease could persist indefinitely in a piggery. After the initial abortion "storm," most pigs, therefore, become infected early in life and the economic loss may then be confined to sporadic abortions in sows that retain the infection into their first pregnancy.

Whether abortion or stillbirths occur depends on whether the sow is infected early or late in pregnancy. Infection during early and mid-pregnancy leads to abortion and poor survival of piglets, but in very late pregnancy little or no ill effects are seen, at least in that litter.

There is little permanent effect on subsequent breeding. Sows aborting due to leptospirosis, when re-mated, usually conceive to first service and produce normal litters.

The disease apparently has no effect on the boar.

The aborted piglets present a bloated, water-logged appearance.

Diagnosis

In diagnosis, again we rely on a blood test somewhat similar to the test for brucellosis previously mentioned. Since sows must be infected while pregnant for abortion to occur, a positive reactor may have a normal litter or if she aborts the fact that she reacts may not necessarily mean that the abortion is due to leptospirosis.

Despite this limitation, it is considered that where a high incidence of reactors is found in a herd where abortion is occurring, then leptospiral abortion can be suspected.

However, if the incidence is high, but sows recently aborting are negative, then a diagnosis of leptospiral abortion may not be justified. It is therefore necessary to correlate reactions with the histories of the individual sows.

Urine samples are another aid to diagnosing the presence of leptospirosis in the herd. Urine should be preserved with a few drops of formalin before forwarding to the laboratory, where it is examined microscopically.

Aborted foetuses and piglets are useful for confirming the diagnosis, as the germs may be found in the liver, kidney, and body fluids.

Control and Treatment

Control rests in a combination of vaccination and treatment. The precise use of these two methods will depend on the size of the herd, and the number of reactors.

In a large herd where the infection rate is high, vaccination of non-reactors, maiden sows and introduced stock, coupled with isolation of these animals from known infected stock will control the disease.

In smaller herds or herds with few reactors, vaccination of animals negative to the test and treatment of infected stock with streptomycin at the rate of 1 gram per 100 lb. will eliminate the disease.

In infected sows advanced in pregnancy, treatment may not have a great deal of effect in preventing abortion, but it will eliminate the sow as a carrier and thereby protect the rest of the herd.

Other Dangers of Leptospirosis

As stated before, this disease causes a severe fatal disease in calves. Since pigs will pass the germ in their urine for a considerable time after infection, the danger of running calves with pigs or in the drainage from pig sties cannot be overemphasised.

Brucellosis and Leptospirosis in Man

Both these diseases are infectious to man. Brucellosis causes a chronic fever called undulant fever. Leptospirosis causes a severe, painful fever (*Leptospira pomona* was first isolated from a dairy farmer). It is important, therefore, not only to control these diseases for economic reasons but also for your own health's sake.

NON-INFECTIOUS DISORDERS

Factors in this group which influence the number of stillbirths which occur include: Litter size, age of the sow, and dietary deficiency. Dietary deficiency includes deficiencies in calcium, protein, and vitamin A.

We will deal with these in order:

1. *Litter size*—As a general rule, there is a higher incidence of stillbirths in piglets in very large and very small litters than within the middle range (4 to 12).

2. *Age of the Sow*—Stillbirths increase in proportion with increasing age, sows over three years of age may have up to 14 per cent. stillborn piglets.

To overcome this, cull old sows.

3. *Calcium Deficiency*—This increases the percentage of stillbirths but before the percentage reaches 50 per cent. obvious signs of calcium deficiency are seen in the sow.

To overcome this, add bonemeal to the ration.

4. *Protein Deficiency*—Protein deficiency has more effect on fertility than on stillbirths. The symptoms seen are those of malnutrition. The sows are poor and those piglets born are very small and some may be mummified.

Correct by balancing the ration to provide protein with meatmeal, and so on.

5. *Vitamin A Deficiency*—The results of a lack of vitamin A are (1) abortions due to degeneration of the attachment of the piglets in the uterus and (2) where abortion does not occur, piglets are born weak and deformed, the most common deformity being abnormal eyes and deformed legs.

The affected sows will show signs of vitamin A deficiency, namely, cloudiness of the eye, thickening eyelids and loss of hair.

Green feeds are a rich source of vitamin A. Therefore, good grazing will overcome this disorder. Failing this, feed some proprietary vitamin A supplement at the correct rate.

Department Will Help

Brucellosis, leptospirosis and several dietary disorders can cause abortions and stillbirths in pigs.

All these can be overcome. In the case of brucellosis, by disposal of positive reactors to the blood test, leptospirosis by vaccination and treatment, dietary disorders by correct feeding.

Officers of the Department of Agriculture and Stock will help you should abortions and stillbirths hit your herd.

Erosion Problem With Contour Banks

Over 2,000 Queensland farmers can listen to the wet season's downpours drumming on their roofs without fear that their land will be washed away. These men have taken the first steps in combating erosion by providing grassed waterways for the safe disposal of runoff water from their properties and have constructed contour banks to intercept runoff on their cultivated lands. Recently, when 11 inches of rain fell in 12 hours near Jandowae, soil was lost to plough depth on many fallowed fields not protected by contour banks. Adjacent contoured fields stood the test and little or no damage was recorded on these properties. Although contour banks aren't the whole answer to the erosion problem they do prevent the serious scouring so often seen on unprotected sloping cultivated lands during the wet season. It isn't too late to do something about protecting your fields so contact your nearest soil conservationist now.

—*J. E. LADEWIG, Chief Soil Conservationist.*

Desucker Your Bananas One Of These Ways

By **F. W. BERRILL, Horticulturist.**

Several methods of desuckering bananas are used in Queensland and others are practised in various overseas countries. Recent investigations at the Maroochy Experiment Station indicate that kerosene treatment of the cut sucker or, alternatively, removal of the growing point with a special gouge are both satisfactory.

Many years ago, it was generally accepted that the banana required a highly fertile soil with good moisture-holding capacity. These conditions were usually satisfied by plantations established on newly cleared scrub land, preferably on slopes where there was little danger from frost. As a general rule, fertilizer was not applied and all suckers were permitted to develop. This meant that frequently three or more good bunches would be cut from the one stool over a comparatively short period.

At the present time, however, most commercial plantations are on replant land or on new land of relatively low fertility. Usually, the soil is naturally deficient in plant foods and has only a limited capacity for holding moisture. Except in areas where irrigation facilities are available, something must be done to balance production per acre with soil reserves of nutrients and moisture; otherwise the bunches must necessarily be reduced in size. In practice, this is achieved by reducing the number of plants within each stool to a workable level—in other words, by desuckering.

What is Desuckering?

Desuckering is simply the removal of surplus suckers from a stool or their destruction. The method which is adopted should be relatively simple. At the same time it should be sufficiently effective to ensure that the sucker destroyed or removed is not likely to shoot again.

Probably no method of desuckering is entirely satisfactory from the point of view of complete eradication, coupled with simplicity and speed. Nevertheless, kerosene treatment and gouging have proved outstanding in the Maroochy trial.

With Kerosene

In the kerosene method of desuckering, the sucker is cut off close to ground level with a sharp knife and the centre of the remaining basal portion is gouged out to a depth of about half an inch with the point of a knife. A small quantity of lighting kerosene (about half a teaspoonful) is then poured into the central cavity.

The kerosene may be carried in almost any type of container. One is a bottle with a cork through which passes a short length of copper or glass tubing; the delivery of the liquid can be fairly accurately controlled with this device. Another is a pressure-type oil can.

This method of desuckering is very effective under most conditions. The number of suckers which shoot again after treatment is very low, provided you don't attempt to kill small "peepers" which are only one or two inches above ground level. With these, it is virtually impossible to gouge out the centre and, in any case, the growing point is usually well below ground level so that the kerosene may not reach it. A poor kill often results.

When using kerosene, avoid treating suckers which arise on the corm above ground level and have no root system. These suckers are entirely dependent on the parent plant and the kerosene may move back into the sap stream and injure it. The best method of handling these suckers is to cut them off level with the parent corm.

It is sometimes claimed that, during periods of active growth, the flow of sap at the cut

Plate 1

Mons Mari Banana. Typical bunch on a well-managed plantation where desuckering is practised.

surface is so great that the applied kerosene floats off, spills over the sides of the sucker butt and burns the young roots. However, a considerable volume of kerosene must be applied before any root damage can occur, because the soil in close contact with the sucker absorbs the liquid as fast as it spills over. In any case, even in a vigorously growing sucker, there is always a delay of a few seconds after cutting before the sap flows in sufficient quantity to fill the central cavity. If the kerosene is applied quickly, therefore, it has every chance of coming into direct contact with the plant tissues. It is advisable, of course, to increase the dosage slightly under these conditions.

Power kerosene is sometimes used as a substitute for lighting kerosene. However, the change does not increase the efficiency of the treatment and the power kerosene is somewhat more unpleasant to handle.

Plate 2

Banana Plants with Young Suckers. Where desuckering is practised, suckers should never reach a height of more than 3 ft. Note bottle with kerosene used by operator (foreground).

Another variation from standard practice is the use of an injector to place the lighting kerosene at the centre of the sucker without cutting off the head of the plant. This method appears to be equally effective. It is, moreover, much faster and less laborious. However, the injection method tends to complicate the situation when followers are being set for the next crop. Since injected suckers show no obvious symptoms of treatment for a few days, it is very easy to double-treat some and miss others or to inject suckers which were to be retained as followers.

With the Gouge

Many desuckering methods involving cutting or gouging have been evolved in various overseas countries, and some are quite widely used in Australia. Probably the most common is the use of the desuckering gouge.

This tool consists essentially of a narrow, curved "blade" about 15 in. long and 1½ to 2 in. wide, tapering to a point about half an inch across, and sharpened on both edges. It is generally fitted with a handle of any convenient shape.

The gouge is inserted into the sucker in an almost vertical position, and by giving one complete turn the growing point of the sucker is removed leaving an inverted cone-shaped cavity.

This method of desuckering was widely used many years ago. However, the exposed corm tissue provides a very good breeding ground for the banana weevil borer and most growers prefer to use the kerosene treatment. With the good control of weevil borer now obtained with insecticides, interest in the gouging method of desuckering has increased, but it is probably little faster than the kerosene method and the amount of regrowth is greater. This is particularly so in the case of very small suckers.

Other Methods

Another method of removing suckers involves the use of a desuckering bar. This is essentially a small crowbar with an enlarged blade. It is a satisfactory tool for removing suckers required as planting material but owing to the inevitable root damage to the parent stool, the use of a bar cannot be advocated in commercial plantations. Desuckering by means of the mattock has the same defect.

In some overseas countries, the suckers are cut at ground level without any further treatment. This procedure, though very fast and simple, is complicated by very considerable regrowth and can hardly be recommended in commercial plantations where efficient use of labour is an important consideration.

You will realise that the choice of a desuckering method lies mainly between one of the kerosene treatments and the desuckering gouge. The final decision between these two will be influenced by the particular plantation and the relative skill of the grower himself in applying either method.

Plate 3

Disorder in the Plantation. A legacy of erratic and inefficient desuckering. Plants are out of position; they lack vigour and are unlikely to produce good bunches.

Queensland Fauna Sanctuaries

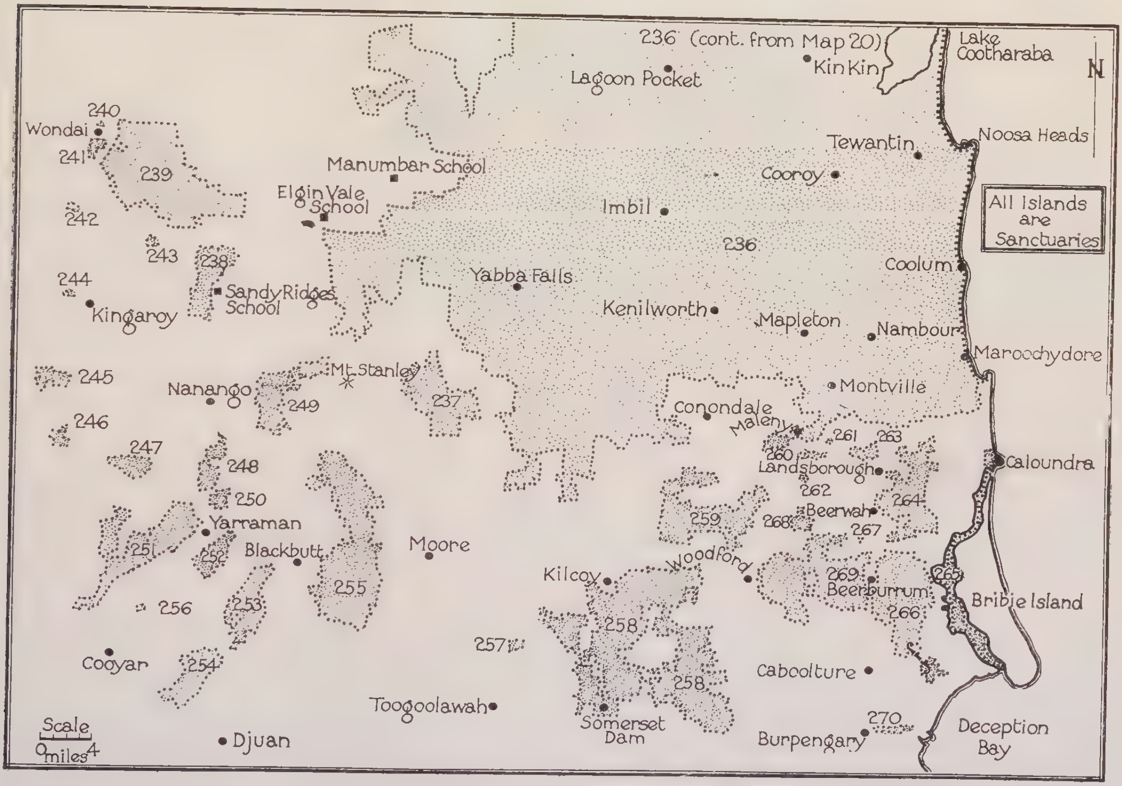
By C. ROFF, Fauna Officer.

The following is an index of the sanctuaries outlined in Map 21.

SANCTUARY INDEX

Index No.	Sanctuary	Area in Acres
237	State Forest Reserve 343, Parish of Monsildale, via Mount Stanley	16,200
238	Area on left bank of Barker Creek via Kingaroy, Broadwater Camping and Water Reserve 354, via Kingaroy	8,100
239	" Wattle Camp " via Wondai	3,987
	Property at Johnstown, via Wondai	1,351
	State Forest Reserve 12, Parishes of Cherbourg and Charlestown, via Kingaroy	31,219
	Property at Johnstown, via Wondai	1,286
240	Property at Wondai	71
241	State Forest Reserve 535, Parish of McEuen, Wondai	1,020
242	Camping and Water Reserve 15, Wooroolin	326
243	State Forest Reserve 536, Parish of Charlestown, via Kingaroy	657
244	Mount Wooroolin Parks Reserve, Kingaroy	158
245	Stuart River, via Boonenne	2,252
246	State Forest Reserve 117, Parish of Kunioon, via Goodger	1,128
247	State Forest Reserve 118, Parish of Tarong, via Brooklands	3,050
248	State Forest Reserves 465, 466 and part of 289, Parishes of Cooyar, Avoca and Yarraman	1,820
249	State Forest Reserves 149, 299 and 456, Parishes of Avoca and Coolabunia, via Nanango	7,830
250	State Forest Reserve 316, Parish of Cooyar, via Yarraman	900
251	State Forest Reserves 120 and 289, Parishes of Tarong, Taromeo, Cooyar and Neumana, via Yarraman	22,860
252	State Forest Reserves 140, 379 and 470, Parish of Cooyar, via Yarraman	4,422
253	State Forest Reserve 257, Parishes of Cooyar and Emu Creek, via Cooyar	8,800
254	State Forest Reserve 258, Parishes of Djuan, Cooyar and Emu Creek, via Cooyar	8,340
255	State Forest Reserves 52, 283, 452, 480, 485 and 549, Parishes of Colinton, Emu Creek and Taromeo, via Blackbutt	5,311
256	" The Palms," National Park Reserve 586, Parish of Cooyar, via Cooyar	30
257	Deer Reserve, Cressbrook (Balance in Index No. 258)	737
258	Deer Reserve, Cressbrook	12,200
	Stanley River Catchment, Somerset	40,320
	" Koolawan," Mount Byron, via Esk	560
	Neurum Creek Reserve, Neurum	87
	State Forest Reserves 458, 637, 893, 1,152, Parishes of Byron, Neara, Kilcoy and Cressbrook, via Somerset	22,570
259	State Forest Reserves 322 and 370, Parishes of Durundur, Kilcoy and Conondale, via Woodford	18,660
260	Timber Reserve 311, Parish of Durundur, via Crohamhurst	1,000
261	" High Tor," Maleny	83
262	State Forest Reserve 753, Parish of Durundur, via Crohamhurst	124
263	State Forest Reserve 291, Parish of Bribie, via Landsborough	880
	National Park Reserve 295, Parish of Bribie, via Landsborough	342
264	State Forest Reserves 108, 160, 442, 561 and 611, Parishes of Bribie and Beerwah, via Beerwah	13,395
265	Township of Caloundra	1,280
	Pumice Stone Channel, near Bribie Island	15,692

Index No.	Sanctuary	Area in Acres
266	State Forest Reserves 611, 674 and 700, Parishes of Beerwah, Canning and Toorbul, via Beerburrum	27,974
267	"Ngungun," National Park Reserve 127, Parish of Beerwah, via Glasshouse Mountains	120
268	State Forest Reserve 313, Parish of Durundur, via Peachester	1,790
269	"Tibrogargan," National Park Reserve 233, Parish of Beerwah, via Glasshouse Mountains	720
	"Coonowrin," National Park Reserve 749, Parish of Beerwah, via Glasshouse Mountains	280
	"Beerwah," National Park Reserve 750, Parish of Beerwah, via Glasshouse Mountains	320
	State Forest Reserves 60, 173, 589, 638, 666, 699, Parishes of Beerwah, Durundur, Canning and Waraba, via Beerburrum, Woodford and D' Aguilar	25,901
270	Burpengary Creek Picnic Area, Burpengary	15
	Property at Burpengary	392


236 (cont. from Map 20)
Lake Cootharaba
N
Kin Kin
Lagoon Pocket
Noosa Heads
Tewantin
240
Wondai
241
239
Manumbar School
Cooroy
All Islands are Sanctuaries
Elgin Vale School
Imbil
242
236
243
238
Coolum
244
Sandy Ridges School
Yabba Falls
Kingaroy
Kenilworth
Mapleton
Nambour
Maroochydore
245
Mt. Stanley
Montville
Nanango
249
237
Conondale
Maleny
246
261
263
247
260
Landsborough
Caloundra
248
262
250
259
Beerwah
264
Yarraman
268
267
251
252
Blackbutt
Moore
Woodford
Kilcoy
269
265
255
Beerburrum
Bribie Island
256
253
266
258
257
Cooyar
254
Caboolture
258
Toogoolawah
Somerset Dam
270
Deception Bay
Scale
0 miles 4
Djuan
Burpengary

Map 21

Map Showing Sanctuaries in Part of Fauna District No. 1. The sanctuary boundaries (as at December 31, 1957) are delineated by dotted lines enclosing the stippled areas.

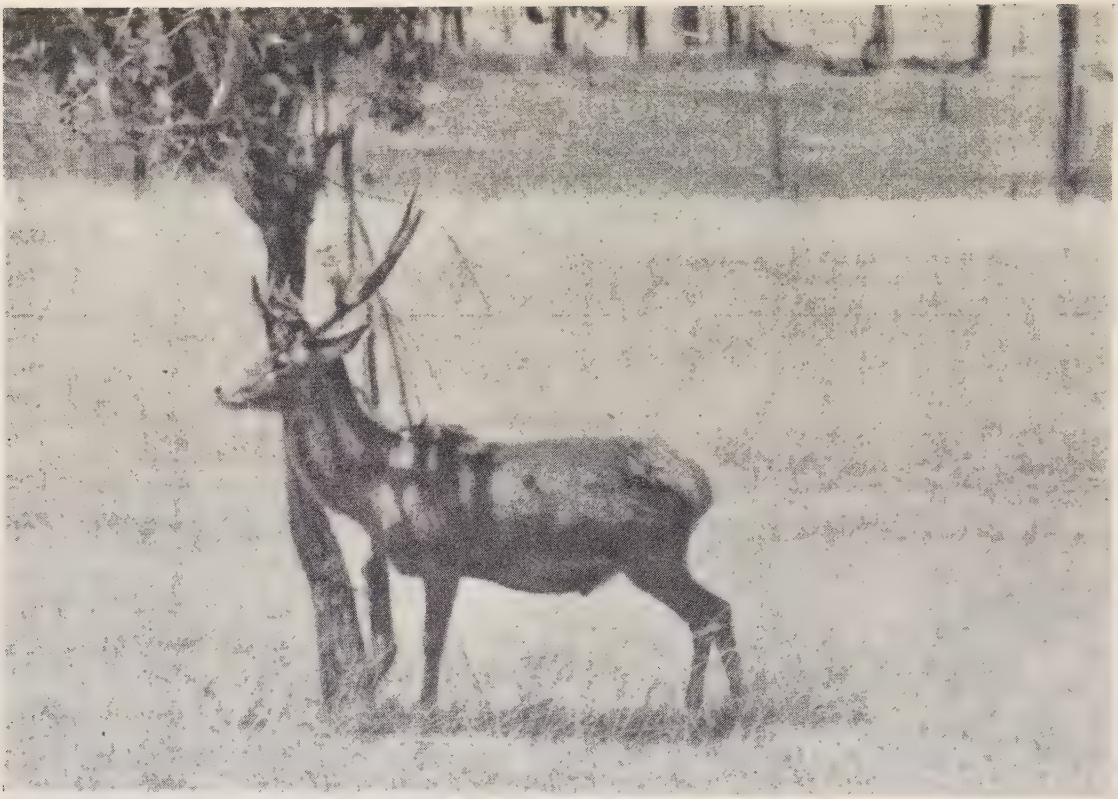


Plate 9

The Deer Reserve, Cressbrook, Provides Refuge for Red Deer

(*Cervus elephas* L.)

* * *

Plant Pineapple Tops Now

For a full summer crop in 1962, pineapple growers in southern and central Queensland must get their autumn planting of tops finished by the end of March this year. Late planting reduces yields and lowers fruit quality.

You risk an off-schedule crop if planting is put off until April. If, by the end of March, you haven't filled the area assigned to an autumn planting of tops, round off the block there and then.

Make up any deficiency with an increased September planting of forward slips.

Planting tops before the end of March presents some problems. This is partly because the work comes at a time when the grower is already busy, and partly because the wet season makes it difficult to get the land in the right condition for planting. But the job can be done if you make the most of the dry spells between the rains.

—*K. KING, Senior Horticulture Adviser.*

Laying A Concrete Floor For Domestic Use

By H. WOODINGS, Silo Construction Officer.

These notes explain the construction of concrete floors of bathrooms, laundries, water closets, small verandas, and so on.

THE most suitable foundation for concrete slab floors is sand, rock, or soil containing a high percentage of sand and silt, but soils with a clay content not exceeding 30 per cent. should be satisfactory. Unsuitable soil types are those which contain a high percentage of clay.

Flat or nearly flat sites are most suitable. Where it is necessary to excavate, the filling should nowhere exceed 9 in. in thickness. Low-lying sites, where the water is present in the ground, are unsatisfactory.

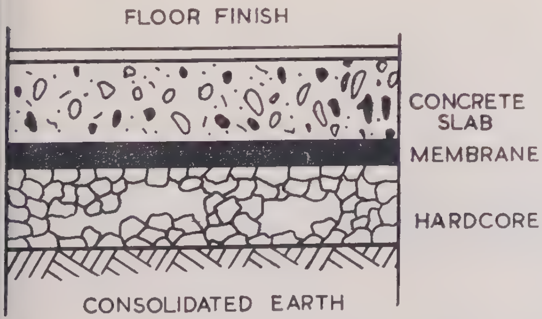


Plate 1

Membrane Placed on Top of the Hardcore Fill or the Consolidated Earth Under the Structural Slab.

Preparing the Site

The site should be cleared of the immediate top soil and vegetable matter which is likely to attract vermin and white ants.

Filling should always be clean, hard material. Clay filling should be avoided because of its liability to movement. Where filling over 3 in. in depth is necessary, the material should be consolidated in two or three separate layers none of which is over 3 in. thick.

For structual reasons, it is advisable that no particular depressions should be left in the finished ground surface.

Damp Proofing

Every possible effort should be made to keep the upper surface of the finished slab continually dry.

Moisture may rise in the concrete slabs in one or more of three ways—

(1) Simple water pressure.

(2) Because of capillary action.

(3) In the form of water vapour.

The capillary rise of moisture may be simply avoided by the placing of a layer of hardcore (stone or similar material) beneath the concrete

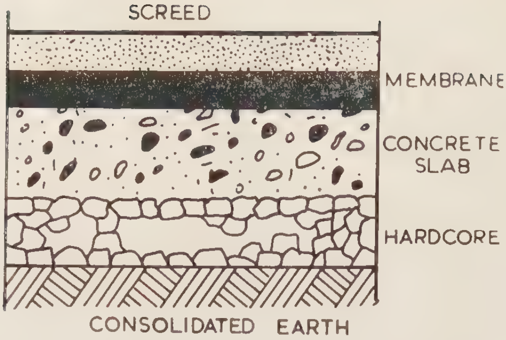


Plate 2

Membrane Placed on Top of the Structural Slab and Under a Concrete or Mortar Screed.

slab. Where hardcore is used, it should be clean and of the one grading about ¾ in. and a minimum thickness of 4 in. This hardcore should never be covered with sand or earth.

Where a membrane is used to prevent the rise of moisture it may be placed as in Plate 1 or Plate 2.

The depth of the hardcore should be a minimum of 4 in. and the depth of the concrete slab 3 in.

Screed

Irrespective of the type of finish for the slab, it is usually necessary to provide a screed of cement mortar or concrete to level and smooth the surface. The minimum thickness of the screed should be—

1. On a bituminous or asphalt membrane 2 in.
2. As a finish applied to the concrete slab before this has hardened .. ¾ in.
3. As a finish applied to freshly hardened concrete .. .. 1 in.
4. As a finish applied to old concrete .. 1½ in.

Preparing for the Screed

On a bituminous surface, no particular preparation is necessary only a thorough sweeping of the surface of the membrane. Another method is a sprinkling of sand over the membrane surface to assist adhesion of the screed.

Where the screed is placed immediately after the base slab is laid and before it has hardened, the slab surface should be cleaned of scum and foreign matter.

Once the concrete has hardened, it is necessary to clean it and expose a fresh surface. This may be done by roughening with a pick.

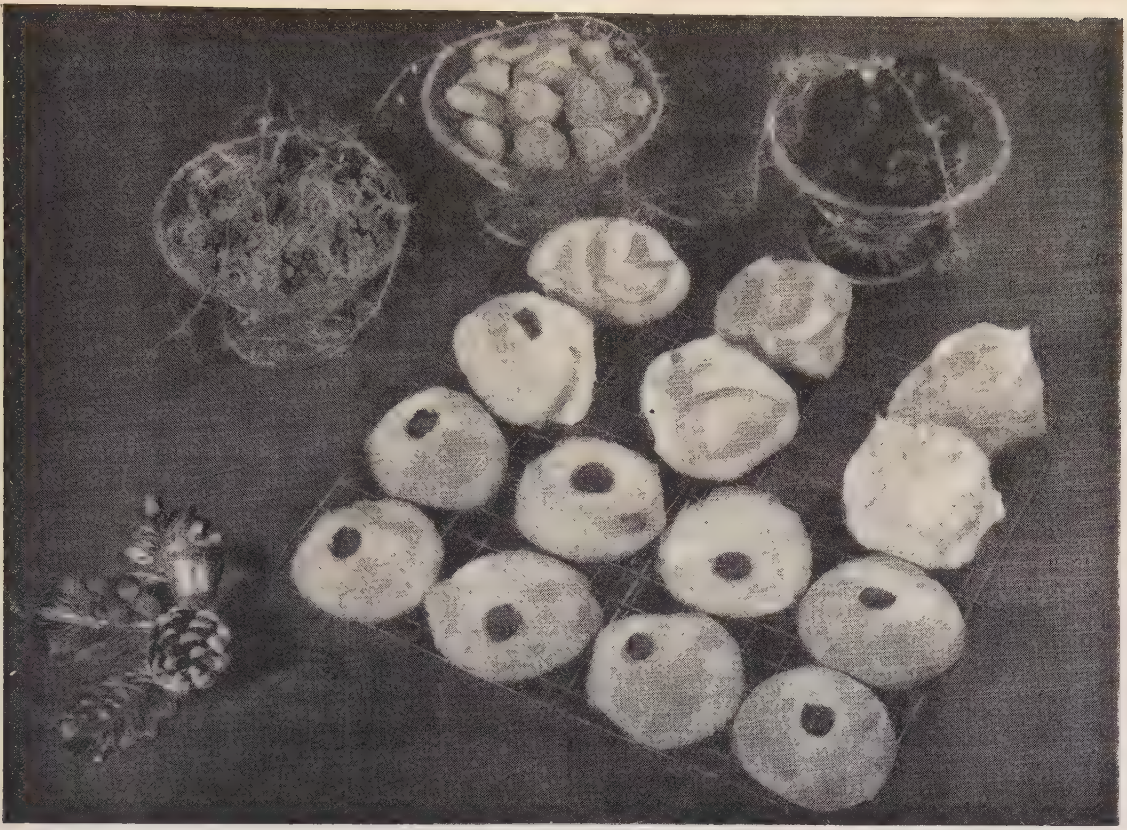
After the surface has been brushed, it should be flooded with water and kept wet for about 24 hours. Immediately before screeding, all free water should be mopped up and a grout of neat cement, or a mortar consisting of one part cement to one part sand, washed over the surface. The thickness of the grout or mortar should not exceed $\frac{1}{16}$ in. and the screed must be applied before the grout or mortar has dried.

Applying Hot Pitch or Bitumen

Dust is usually the main cause of bitumen not covering well. Thorough brushing and the application of a cold brushed primer will, however, bring dry surfaces to a proper condition to receive the hot layer. Both bitumen and pitch can tolerate slight dampness of the surface to which they are applied and, if they are to be used as sandwich layers in the depth of a structural floor, the base concrete layer should, in dry weather, be ready to receive them within about three days after placing.

The coverage on a primed and smooth surface should be 6–7 gal. for every 100 sq. ft. of floor area.

The material should be heated to a fluid consistency suitable for pouring and care should be taken with pitch to avoid overheating (a temperature of 170 deg. C. should not be exceeded). The material is simple to pour over the surface and should be encouraged to run. This can be done by the use of a squeegee or the edge of a piece of hardboard. The finished appearance should be shiny and the concrete area should be totally covered.



Extras For The Holiday Season

From the JUDITH MAY KITCHEN,
directed by RUBY BORROWDALE,
for the Butter Marketing Board.

EVERY wise housewife knows that the Christmas dinner is the Meal of the Year but she also knows that the holiday season calls for any number of snacks, suppers and picnic unches.

Visitors must be catered for, the late supper is an essential part of holiday catering and the picnic baskets must be well supplied with savouries, cakes, cookies and pies.

So start your cooking early and have handy a good supply of savoury shells to help with the quick snack for visiting friends and relations. Biscuits, small cakes and tarts can be stored for instant service whilst puddings can be held ready for heating when the moment arrives.

This way you will find and enjoy a more leisurely approach to holiday time with all its joy and pleasure. Here are a few tested recipes that may help to inspire the country cook :

SNOW-CAPPED PRUNES

Forty dessert prunes, 12 glace or maraschino cherries (well-drained), ½ cup chopped walnuts, 2 egg whites, ⅛ teaspoon salt, ½ cup castor sugar and ½ teaspoon vanilla. Rinse the prunes and place in a colander or steamer over boiling water. Cover and steam 10 min. Cool then slit and remove stones. Chop prunes and cherries roughly; add the nuts. With damp fingers, shape this fruit-nut mixture into 24 small balls. Beat egg whites and salt with rotary beater until fluffy and thick but not dry. Add sugar slowly and continue beating until a very thick mixture is formed. Add vanilla. Coat each fruit ball completely with meringue. Lift with fork on to buttered scone tray. Garnish each with half a cherry if you wish. Bake in a very slow oven (275 deg.F.) from 40 to 60 min. until firm and dry but not coloured. Cool on the tray and remove with a spatula.

MERINGUE PUFFS (illustrated)

Beat the whites of 2 eggs until thick and fluffy adding a pinch of cream of tartar and a pinch of salt during the beating. Beat until very thick then fold in one-third cup pure icing sugar. Have ready as great a variety of chopped fruits and nuts as you can manage—pitted dates, pieces of preserved ginger, quarters of dried figs, pieces of crystallised pineapple, halves of walnuts and whole blanched almonds. With a fork, dip in and coat each piece of fruit and nut completely with meringue and place on trays, lined with buttered parchment paper or aluminium foil. Bake in a slow-moderate oven (325 deg.F.) about 40 min. or until completely dried and a pale biscuit colour. These dainty, little home-made sweets are perfect for serving with after-dinner coffee.

DROP BUTTER COOKIES (illustrated)

Four ounzes butter, 1 cup castor sugar, yolks 3 eggs, ½ teaspoon vanilla essence, 3 drops lemon essence, ¼ cup milk or orange juice, 2 cups self-raising flour, ¼ teaspoon salt. Sift flour and salt. Cream butter; add sugar, egg yolks and flavourings. Beat until light and fluffy. Add some of the flour, then the liquid and blend evenly. Gradually blend in remaining flour. Drop batter by the teaspoonful, about 2in. apart on buttered baking trays. Decorate if you wish with nuts, fruits or coconut. Bake in moderate oven (375 deg.F.) about 15 min. or until golden coloured. Cool on cake racks. Makes about 4 dozen.

REAL CHOCOLATE COOKIES

Follow the drop butter cookies recipe and add 1 packet of semisweet chocolate bits to the sifted flour and salt.

ALMOND PASTRY (for little fruit pies or tarts)

Five ounces butter, 2 cups plain flour ½ teaspoon salt, ½ cup blanched and very finely chopped almonds, 1 tablespoon sugar and from 3 to 4 tablespoons milk. Dissolve the sugar in the milk. Sift flour and salt into bowl. Add the butter and rub it in finely. Stir in the almonds Moisten with just enough of the sugar and milk to make a very firm dough. Roll to a little less than ¼in. in thickness and cut into circles with fluted cutters. Cut some 4 in. circles and some 2 to 3 in. Prick surfaces. Fit the smaller circles over the backs of small patty pans and the larger ones over inverted pie pans. Bake in hot oven (400 deg.F) about 10 minutes, or until crisp and golden. Remove carefully from pans and when cold store in biscuit tins. These can be filled with fresh or canned fruits, ice cream and whipped cream. The smaller ones with lemon cheese.

PEACH ALMOND TARTS

Use the large size Almond Pastry Shells. Melt ¾ cup tart red jelly (apple, quince or red currant) over hot water. Put 1 tablespoon of the jelly into each tart shell. Top with half a fresh or canned peach, cut side down. Pour over the remaining jelly and chill. At serving time, top with sweetened whipped cream. Garnish with toasted and blanched almond halves.

TINTED COCONUT

For a special cake or creamy dessert topping you may want to tint dessicated coconut a pale pastel colour. Just place coconut in a glass jar (do not more than half fill the jar). Sprinkle a few drops of diluted food (icing) colouring over the coconut. Cover the jar with lid and shake vigorously until the coconut is evenly coloured.

BOILED RAISIN CAKE

One cup seeded raisins, 2 cups water, 1 cup sugar, 4 oz. (½ cup) butter, 1 beaten egg, ¼ teaspoon salt, 1 teaspoon ground cloves, 1 teaspoon baking soda, ½ teaspoon vanilla, 2 cups plain flour, ½ teaspoon baking powder. Place raisins and water in saucepan and boil until 1 cup juice remains—strain juice off raisins, cool then add the soda. Cream butter and sugar, add beaten egg. Sift flour, salt, spice and baking powder. Mix dry ingredients and raisin juice alternately into creamed mixture. Beat smooth. Add raisins. Bake in a paper-lined 7 or 8 in. fruit cake pan in moderate oven (350 deg.F.) about 45 min. Cool in the pan on a rack.

TRIFLE

Any kind of plain butter sponge layers cut into strips and spread generously with jam (strawberry or raspberry). Place one quarter of cake and jam strips criss-cross in glass serving dish and cover completely with chilled custard. The cake can be sprinkled lightly with brandy or sweet sherry if you wish. Repeat layers until cake and custard are used, ending with custard. Cover and chill overnight, or at least 8 hours before serving. Top with whipped cream and sprinkle with chopped nuts. Serve with squares of red and green jelly. Set jellies in square pans and then cut with knife dipped in hot water.

Note: You will need 2 pints of custard sauce for a large trifle.

◆

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What a Sire Survey Is.—When a dairy sire is surveyed, a comparison is made of the production records of all the bull's daughters in the herd with those of the other animals in the same herd. The yields used for the comparison must have been produced in the same season.

The results of the comparison indicate whether or not the bull's daughters are yielding more or less than the other cows in the herd under the same conditions.

As it would be unfair to compare the yields of 2-year-old animals with that of five-year-olds, it is necessary to bring the records to a common level. The usual practice is to bring all production to maturity equivalent. That is, to estimate from a younger animal's yield how much she will produce when she is a mature cow. For this purpose, maturity equivalent or age correction factors are used. To obtain factors suitable for Queensland conditions, tens of thousands of production records have been used and average factors compiled.

Under this system, a reliable estimation of a bull's value can be obtained, provided all cows in the herd are tested and all the bull's daughters in milk on the farm are also recorded.

Anyone who is interested in the performances of his bull should apply for a survey. This can be done through his local Dairy Office or by writing to the Department of Agriculture and Stock, Brisbane.

—S. E. PEGG,
Chief Adviser, Herd Recording Section.

Trouble-free Milk Refrigeration.—A check on the mechanical efficiency of your dairy refrigerator can save you pounds.

Trouble-free refrigeration means that no milk is rejected at the factory through faulty cooling. And the difference between milk and second grade cream is 17s. 6d. for every 10 gal. of 4 per cent. butterfat milk rejected.

A dairy refrigerator is such a reliable piece of equipment that it's easy to take it for granted. But to give efficient service it must be properly cared for. Have it overhauled by a qualified refrigeration mechanic. He will check the gas supply and top it up if necessary. He'll also look for oil and gas leaks and loose or worn belts, and will check the running conditions generally. Don't wait for trouble; get in first by having a mechanic check your refrigerator.

—J. ARMITT, Dairy Officer.

Boiling Water Kills Dairy Bacteria.—Boiling water is the answer to thermoduric, or heat-resisting, bacteria in milk. These bacteria, which can withstand the pasteurising temperature, impair the keeping quality of milk.

But boiling water will kill thermoduric bacteria. In combatting heat-resisting bacteria, your first step is to make sure that the water in your dairy boiler is actually boiling when you go to sterilize your equipment. Then your care is to see that this heat is not lost before the near-boiling water can do its job.

If you use a set-in copper, don't ladle out the boiling water with a dipper as this loses heat. Dip out the boiling water in bulk. Where an electric boiler is used, hold the container as close to the tap as possible. If you have a steam sterilizer, fit a silencer to the steam hose so you can be sure the water actually boils.

—R. I. HUNTER, Dairy Officer.

Queen's Dressmaker Prefers Wool To Any Other Fabric

By FREDA IRVING

"I PREFER wool to any other fabric," declared the Queen's dressmaker, Hardy Amies, during his recent visit to Australia. And this despite the fact that he was travelling on a British cotton promotions tour!

This tall, suave member of London's big ten in haute coutoure, does not base his predeliction for wool on any sentimental bonds-of-empire feeling, nor with any patriotic eye to the economics of any particular member of the British Commonwealth of Nations, but on sheer experienced appreciation of the worth of wool, to a designer in his class.

Proving his appreciation of this worth, Mr. Amies estimates that he uses pure wool for at least 75 per cent. of his coutoure work which travels throughout the world.

Mostly, he uses English woven materials, which he regards as tops as regards quality, but sometimes he uses French woven woollens . . . "occasionally they better the English clothes when it comes to design," he explained.

Australian Fabrics

So far, he has not used any Australian woven fabrics, but now that he has seen some, is definitely interested to do so.

Stating his reasons for considering wool the best of all possible fabrics, this hard-headed business man said:

"Wool is admirable when it as light a weight as 8 or 9 ounces, and adventurously interesting when it is 24 ounces."

"I know of no material which lends itself to surface treatment so well . . . it can be smooth as a baby and as fluffy as a blanket, which helps make for infinite variety in its handling."

"I like its feeling of being alive, and I like, too, the way it responds as well to the iron as it does to the scissors."

"Apart from these obvious facts about wool, which should commend it to any designer, there are my own personal reasons for my preference for pure woollen fabrics," continued Mr. Amies.

Best for Day Clothes

"I like best to make day clothes, and for these, wool is undoubtedly the best fabric in the world. Then, on the whole, I prefer muted colours to very bright ones, and wool takes this type of colouring perfectly. Also, I like subtle mixtures of colours such as you get only in woollen check weaves. Then too, I like plain fabrics to show subtlety of weaves, and here again you get these better in wool than in anything else."

"Do I ever use synthetic fabrics? . . . Not if I can help it. They're all right in their place I suppose, but frankly I can't see where it is."

"No, no one should ever buy synthetics if they can help it," he declared emphatically.

"If someone came in and said I'll give you £1,000 to make me a nylon frock, I suppose I'd make it, human nature being what it is. But I'd certainly never use a synthetic of my own free will," he added firmly.

All this from a man who's quite obviously motivated by no particular leaning to the welfare of the woollen industry, but simply by the hard business core fact that, to use his own words:—

"Wool is good, wool is right, wool is the best cloth I know, so I use it. I couldn't care less if it came from Timbuctoo, the Arctic or Australia. It suits my needs and it suits my suits."

And if anyone should know his fabrics, Mr. Hardy Amies should.

Today he has one of the top London haute coutoure, retail-off-the-peg and wholesale fashion businesses in London, plus representatives in New York, Montreal and Toronto.

Topping off his panegyric on the wonders of wool, the good-looking and slightly-supercilious-on-any-subject-but-wool-Mr. Amies, told a neat story in its further favour . . .

It is about a salesgirl in the Nieman Marcus mighty store in America, who was serving an elderly and obviously very wealthy customer. She plied her with nylon, she plied her with rayon, she plied her with every synthetic under the sun, until, in extreme exasperation, the elderly lady stated her case:

"Young woman, I live in an air-conditioned house. I travel only in my air-conditioned Cadillac. I shop only in air-conditioned stores. Stop showing me this rubbish. What I want is WOOL."

Stop and Listen

"Have you heard the one about the man who . . ." will guarantee you a listening audience amongst men. "What I think about the price of wheat is . . ." will start a number of small dynamos operating in the minds of the audience. They may miss all that is said afterwards in an effort to prepare their own contributions. As soon as you've stopped talking you're left standing. Obviously no one appreciated your point of view—in fact, although they'd heard they hadn't listened.

Not everybody expresses himself clearly. If you are trying hard to get the gist of what's being said, you will ask questions to be sure you *understand* what the other person is saying. Then is the time to debate the issue.

How many times do we interrupt the other fellow with our own views before being clear what he was saying?

Do we try to analyse what is being said to see whether it is fact or merely opinion? We must listen in order to see if the speaker substantiates what he says—proves he is talking facts.

Put These In Your Pipe And Smoke Them!

Here are some suggestions to improve your listening:

(1) Make a decision to increase your skill—and it is a skill—as a listener.

It seems almost impossible to keep quiet sometimes when the other fellow is obviously talking tripe (you think!).

(2) Concentrate on what he is trying to convey—not your opinion of it.

(3) Assume the other fellow is intelligent and has thought about the subject. Seek to prove this by questioning, NOT to prove he is an idiot. Argument frequently develops through lack of sympathy.

(4) Know your own prejudices—don't be fooled by them; others may not be. If you are going to disagree, it's wise to have a good basis for your opinion. Unless you listen to what the other fellow says you may miss the big weakness in your own case.

Brain v. Mouth

Listening is made more difficult by the fact that the brain can work faster than the other fellow's mouth. Day-dreaming the time in between requires the least concentration; preparing the next barrage seems worthwhile as it will inflate our ego a bit more; but listening intently to someone else in order to understand him requires much more concentration.

It has its rewards—try it!

—J. R. M. WOLFE,
Extension Training and Research Officer.

orchard and garden

When to Fertilize Bananas.—The number of fruit in a banana bunch is decided long before the bunch emerges and is visible. Flowers are initiated about 4 months after planting and are laid down in the corm below ground level.

Only a strong, healthy plant can be expected to bear a good bunch. Early vigour and growth are dependent on the amount of food available and, of course, the suitability of growing conditions. In turn, bunch size and fruit numbers are determined by this early vigour and growth.

Obviously, the first 3 or 4 months are the critical period when plant foods must be adequate.

The banana is a gross feeder and heavy fertilizer usage is normally essential. Three applications of a 8-10-8, 9-8-7, or similar mixture are usual.

First, after planting, about 1½ lb. is applied to each stool site and worked into the soil. Two months later, 1½ to 2 lb. is given to each plant—applied in a wide band about 12in. away from the base. A third application of 2 lb., two months after the second, completes the programme.

The young plant will thus receive ample supplies of nutrient within 4 months of planting, ensuring a sound basis for bunch growth and development.

—*D. DOWDLES,*
Adviser in Horticulture.

Grade Your Pineapple Plants.—Graded planting material reduces costs of harvesting, increases yields and spreads the pineapple crop.

When returns are below normal, only the efficient pineapple grower can hope to make a reasonable living out of the crop. One worthwhile practice is the use of graded planting material. It guarantees a uniform stand of well-grown plants. All types of planting material are graded by weight. With tops and slips, two grades are sufficient but with suckers which vary considerably in size, three grades are needed. The job is done on or near land which has been prepared for planting and provides an opportunity for discarding damaged or sub-standard material before planting begins. Each grade of planting material is established in its own section of the new area.

Where non-graded planting material is used, the smaller plants are shaded by their larger and more vigorous neighbours. Fertilizer is wasted on these small plants which are unlikely to mature their fruit, and the uneven crop is difficult to handle at harvesting.

When graded planting material is used, the several sections of the new area reach the "forcing" stage in succession over a period of several weeks. The harvesting period is similarly spread and this makes picking easy. Each section is harvested in two or three picks. By contrast, several picks are needed in areas grown from non-graded planting material. The reduction in labour costs of harvesting in graded material is substantial.

In periods of high prices for primary products, cultural refinements can be omitted and the farm will still show a profit. At the present time, the pineapple grower must get the best out of his crop. The use of graded planting material is therefore essential.

—*K. KING,*
Senior Adviser in Horticulture.

Transplanting Passionfruit.—A little care, both before and after transplanting, goes a long way towards ensuring the success of new passionfruit plantings.

The seedlings should be root-wrenched in the nursery bed about a fortnight before transplanting. This is done by pushing a spade down between the plants to sever the main roots at a depth of 6 to 8in. Root-wrenching should be followed by a heavy watering.

The nursery bed should be given a good watering a day or so before the seedlings are transplanted. In transplanting, spread out the roots of the young plants evenly and at a downward angle of 45 deg. The young vines may be set at the same depth as they were in the nursery. It is an advantage, however, to establish grafted passion vines with the graft union well above ground.

—*J. McG. WILLS,*
Senior Adviser in Horticulture.

What Should My Baby Weigh?

So many mothers anxiously ask this question that it is easy to see that most gauge a baby's progress by weight gain only. Actually much more than gain of weight is necessary for a healthy baby. By giving a child nothing but carbohydrate foods you can have adequate if not excessive weight gain, but baby will not be healthy; in fact, he will be very unhealthy, prone to infection, and his fat limbs will be extremely soft.

A healthy baby, on the other hand, will have more resistance to infections and his limbs will feel firm. Protein is necessary for strong healthy babies and milk gives this to growing infants. This is why milk is the staple food in the diet until at least 2 years of age. If baby does not like milk, you should endeavour to replace it by high protein foods such as eggs, cheese, and meat.

Over emphasis must not be placed on weekly weight gains. One week 8 or 9 oz. may be gained and the following week there may be no gain, or only 1-2 oz. This must not worry the mother unduly. She must be prepared for this kind of happening. Weight gain from 1 month to the next is of more importance than from week to week.

The saying that baby should double his birth weight at 5 months, triple it at 1 year, and quadruple it at 2 years, is well known, but this applies only to the baby who is approximately 7½ lb. at birth—that is the average weight of a newly-born babe. A tiny baby who weighs 2-3 lb. at birth should do much better than this and a large baby 10-12 lb. cannot be expected to do nearly as well—in fact he may only double his weight at 1 year.

It is wise therefore to let doctor or sister decide if baby is progressing well. Another point that cannot be overemphasised is that comparison must not be made between your children. When children reach school age you can readily see that their bodily shape and personalities vary. This really applies from birth, but many mothers expect each of their babies to behave in exactly the same way; to put on exactly the same amount of weight; to enjoy exactly the same foods and to sleep for exactly the same length of time. In fairness to the baby no such comparison should be made. Remember each child is an individual and must be treated as such.

Any further matters of this, and other matters connected with children, may be obtained by communication personally with the Maternal and Child Welfare Bureau, 184 St. Paul's Terrace, Brisbane, or by addressing letters "Baby Clinic," Brisbane.

—*Department of Health and Home Affairs.*

More about the secretary

y J. PARK, State Organiser,
unior Farmers' Organisation.

T is the secretary's job to deal with correspondence. If the secretary is prompt, reliable and olite she can earn praise for herself and a olendid reputation for the club.

All letters, except those which finish a corre- oondence, should receive an answer. Not to nswer when written to is as rude as not to nswer when spoken to.

Some delay in answering mail is inevitable, specially when the subject matter of the letter as to be referred to the club executive or con- dered by the general meeting. However, where elay is likely, the correspondent should receive n acknowledgement advising that the letter will e considered and a full reply furnished in due ourse.

Make sure there is no oversight in this; nothing more irritating, and nothing kills interest more uickly, than having one's letters ignored.

eep Copies of Letters

It is most desirable that copies of all letters ritten should be kept. This is a simple matter the secretary uses a typewriter. If the letters e hand-written then a letter-book should be sed with carbon copies being kept. The best opies are produced if a ball-point pen is used ver good quality carbon paper.

When quantities of letters are written a espatch book should be kept in which the mail- g is recorded. This record will substantiate aims for money for postage stamps.

Filing

In-coming and out-going letters must be filed.

To file a letter is to put it with others of a similar kind in a place where it can be found. This is much more difficult than it sounds, because there are several systems of filing, and most secretaries select one or a combination of them to suit their particular circumstances. Things go smoothly until the office of secretary changes hands, then confusion reigns until the new secretary rearranges things.

It is impossible to have a filing system that saves time and worry unless every letter deals with one subject only. It is always worth while writing two letters to the same person (one envelope and stamp will do), if there are two unrelated subjects to write about.

Writing a Letter

We forget so soon the lessons in letter-writing which we received at school, and it may not be inopportune to run through some of the rules once again.

The address to which an answer is to be sent should be written clearly and in full at the top of each letter, together with the date the letter is written. Dates are of the greatest importance, and if they are incorrectly or incompletely given they can cause much confusion and inconvenience.

Always check the day of the week with the date of the month, and make sure that they tally.

If someone is invited to attend a function on Wednesday, 21st January, and upon checking he finds that the 21st is a Thursday, he is in an awkward position. Secretaries would be wise to avoid the use of such phrases as "the second week in the month," because its meaning is uncertain if the month starts in the middle of a week.

The use of the words "instant," "ultimo" and "proximo" with reference to dates is unnecessary and is better avoided.

A letter that begins with "Dear Sir" usually ends with "Yours faithfully," not "Yours sincerely," which is better reserved for more personal letters. Never put into a letter words which cannot be read aloud at a meeting, and avoid the use of slang.

If our signature is difficult to read or spell we should print our name clearly below the signature, not forgetting to add the Mr., Miss or Mrs. to indicate the sex of the writer.

Words can be awkward things and our ea of handling them will determine our success as letter writer. If you find that the words con easily, take care that your sentences dor become ungainly. Short sentences are much mo easily managed than long ones.

Write down what you want to say in simp everyday words, then go through it again, tidyi it up and simplifying the sentences.

Until the secretary has become fluent enoug to turn out really readable letters at the fir attempt, they should be written more than onc A draft or first attempt, should certainly be ma of any important letter, and the final versio should be checked before it is put in th envelope. Make very sure that you sign the lette and that you put it in the correct envelope.

Check to ensure that the address on the envelope is complete and readable, and that you hav fixed on it the correct postage stamp.

Lust For Power Tools

Accidents do happen with electrical power tools, and in the majority of cases the cause has been traced to defective insulation together with lack of effective earthing.

Such occurrences cannot be blamed on the tools, but are due to negligence of the user or owner. What happens is that, unknown to the operator, the earthing conductor incorporated in the flexible cord attached to a faulty appliance breaks, allowing the exposed metal to become "alive," yet not blowing the protecting fuse.

This could happen frequently to many electrical tools which are used under tough conditions, but does not, because wise owners ensure that the tools are maintained regularly by a certificated electrician.

Similarly, wise owners make certain that the equipment is operated ONLY from a three-pi power point which is properly earthed. Th employment of such safety methods assures the of controlled power.

An electrical fatality involves a train of factors: the earthing must fail; protective equipment remain inoperative, the victim must usuall be in contact with earth; the shock current mus traverse the chest; it must be large enough an last long enough to cause fibrillation or respirator paralysis, and lastly, all these things must occu when there is nobody near to render immediat assistance.

—*State Electricity Commission.*

Feeding A Grain Supplement To Beef Cattle

By W. STUBBS and J. J. DALY, Cattle Husbandry Branch.

During the late winter and early spring of 1958, *crushed grain sorghum was used as a supplementary feed for young beef steers when grazing in a paddock of native pasture on the Central Highlands. Here is a description of the work and a discussion on results.*

The project was carried out at "Codenwarra", a property on the Nogoa River about 8 miles north-east of Emerald. The property is owned by Mr. L. J. O. McCosker and managed by his son, Mr. Neil McCosker.

Two paddocks were provided for the investigation by simply dividing an existing paddock. Each paddock comprised an area of 120 acres which formerly carried coolibah and brigalow scrub with a fair sprinkling of bauhinia. Ring barking of the coolibah and brigalow was done many years ago but the bauhinia was left for fodder and shade.

The main grasses now consist of Mitchell—mainly "bull" (*Astrebla squarrosa*) with some curly (*A. lappacea*) and hoop (*A. elymoides*), blue grass (species of *Dichanthium*) with smaller quantities of Flinders (species of *Iseilema*), early spring (species of *Eriochloa*), pitted blue (*Bothriochloa decipiens*) and umbrella grass (*Chloris acicularis*).

A water trough was provided in the line of the dividing fence and thus served both paddocks.

The trial feeding extended from July 31 to November 21. Cold weather and frosts were experienced during June and July; temperatures were then mild in August and September, warm to hot in October and hot during November and December.

Rainfall in June was 245 points, with no falls in July and August, 12 points in September, and 51 points in October. Good rain to the extent of 385 points was recorded in November, followed by 115 points in December.

When the trial began at the end of July there was a solid stand of dry grass which appeared to be little better than straw. These pasture conditions prevailed until November 7, when a fresh shoot appeared as a result of storms. The bauhinia trees and other shrubs produced a fresh growth of leaves in September and the browsing

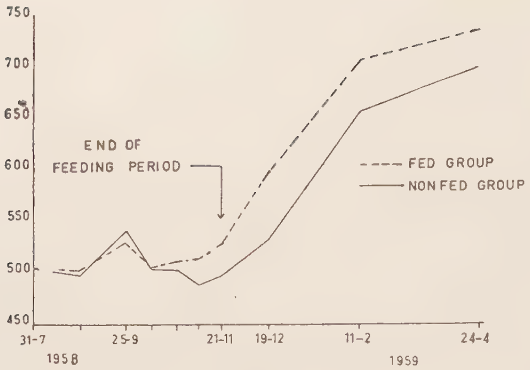

Plate 1

The Growth Rate of Both Groups During and Following Supplementary Feeding.

of these had an influence on the performance of the animals. Good quality pasture feed was available at the end of supplementation on November 21, 1958.

Animals Used

The trial animals were Hereford steers about 12 months of age and in good condition when supplementation commenced. They had been weaned 2 months previously. There were 15 animals in each group and one group (fed group) was offered the supplement while the others (non-fed group) had pasture only. All animals were weighed and paired on a basis of weight. Then one member of each pair went into each group. This gave two even groups and their average weights at the beginning of the trial were the same at 503 lb.

Type of Supplement

The supplement consisted of crushed grain sorghum to which was added 1 per cent. of crushed limestone and ½ per cent. of salt. The ration consisted of 3 lb. of crushed sorghum for each animal daily. The grain was placed out twice weekly (on Mondays and Fridays). Thus, on Mondays, when 4 days' feed was used, an amount of 180 lb. was placed before the stock.

A wooden trough, 16 ft. long by 6 in. wide and 4 in. deep, was used to hold the grain. Empty 44 gal. drums were used as a "stand", as illustrated. At this height the cattle were able to eat out of the trough while wild pigs nosed around the base of the drums in frustration!

The feed trough was located near the water trough.

In the beginning, the steers did not eat the grain although they were mustered and held around the trough. On the sixth day, a little molasses was sprayed on and around the trough and the cattle began to eat almost immediately. From that time onward, the allowance of feed placed in the trough was consumed in less than 24 hours. On one occasion the 4 days' ration was consumed in less than 6 hours.

A stocking rate of 15 head of yearling steers to 120 acres—that is, one beast to 8 acres—was maintained. Weighings were made monthly for the first two months and then every two weeks to the end of feeding. In order to compensate for any possible differences in the pasture feed available in each paddock the groups were alternated in the paddocks after each weighing.

A check has been kept on growth rate after the cessation of supplementary feeding, when all cattle were run together in one group. Weights were obtained at 4 weeks, 12 weeks and 22 weeks after supplementation ceased.

Results

The weights of both groups are shown in Plate 1. During the period of feeding (31-7-58 to 21-11-58), which was 113 days, the fed group gained 26 lb. while the non-fed group lost 8 lb. At this stage the animals in the fed group were heavier by 34 lb. a head on the average. One month after feeding ceased, this advantage was increased to 64 lb. (598 lb. compared with 534 lb.) but then the non-fed group picked up somewhat and were 37 lb. lighter than the fed group when sold at the end of April, 1959,

When examining the graph of weight gain, the rise in weights in September, followed by a fall, will be noted. The September weight was abnormal owing to all animals having had a substantial drink just before weighing.

The rapid response of the fed group to the good pastoral conditions in late November and early December is interesting. It was noticeable that the fed group showed a degree of thriftiness lacking in the non-fed group. This was apparent in the early shedding of the heavy winter coat of hair.

Plate 2

The Grain Supply Had Just Been Placed in the Trough When This Picture Was Taken.

Plate 3

An Ample Supply of Water Was Always Available in Both Paddocks.

Some Slight Scouring

The condition of laminitis or founder may occur when animals are engorged with grain or when full rations containing a high proportion of grain are introduced too quickly. Laminitis occurs following severe indigestion.

There were no severe digestive upsets amongst the fed group of animals but some slight scouring was evident. In addition, there appeared to be a good deal of undigested grain in the dung following the day of feeding.

It is thus possible that equivalent results could be obtained on a smaller ration of grain.

In twice-weekly feeding, the labour requirement is comparatively small. Troughing of some description has to be provided in order to avoid excessive waste.

The pattern of grazing behaviour of the stock did not appear to be unduly influenced by the feeding of the supplement. For instance, the animals did not stay near the trough once it was empty.

It is not suggested that grain is the ideal supplement for animals under conditions such as those described. There is some evidence available to indicate that a high-protein supplement may lead to greater efficiency on the part of the animals. However, it is obvious that there are possibilities in the use of grain in cattle production when it is cheaply produced on the property.

Supplementary feeding of beef cattle should not be looked upon as an end in itself but rather as an aid to maintaining a satisfactory plane of nutrition in the beef animal. It is associated with more intensive development where animals are kept growing steadily for the first 15 to 18 months and then fattened rapidly by the best available means.

In the trial described, it is considered that the fed group may have obtained a greater advantage had supplementation begun at or just before weaning in May. Circumstances prevented the commencement of feeding at that time but during the winter of 1959 this was done with another group of stock, and results will be reported when final weights are taken.

The Department's thanks are extended to Mr. McCosker and his son for their interest and co-operation in the work.

What To Do About Grain Poisoning Of Sheep

By R. B. YOUNG, Senior Adviser in Sheep and Wool.

Here are the facts on grain sickness that causes deaths in sheep, together with advice on what can be done about it.

Grain poisoning, sometimes called "grain fever", or "grain sickness", or "founder", (associated with lameness), is thought to be due to acidosis brought about by excessive intake of grain by sheep.

If a sheep eats large quantities of fermentable carbohydrate the ruminal contents become acid. *Streptococcus bovis,* a bacterial organism normally living in the rumen, multiplies rapidly in the presence of a carbohydrate medium and causes excessive acid production.

Poor sheep are more susceptible than sheep in good condition.

Plate 1

Drought Feeding of Rams near Muttaburra in Central Western Queensland.

Grain poisoning occurs mainly in sheep that have not been introduced gradually to intake of grain. In latter years, with a more widespread approach to drought feeding on an intermittent basis, that is twice weekly, or once weekly, it is likely that there have been more frequent occurrences of grain poisoning than with earlier observed practices of feeding daily. It is also likely that in the crop-sheep areas many cases occur that do not come up for more than a local review.

Behind the problem is the basic need for a gradual, or "conditioned", approach to any grain feeding of sheep. This would appear to be the most important point for sheepmen to to remember when any form of grain feeding is planned.

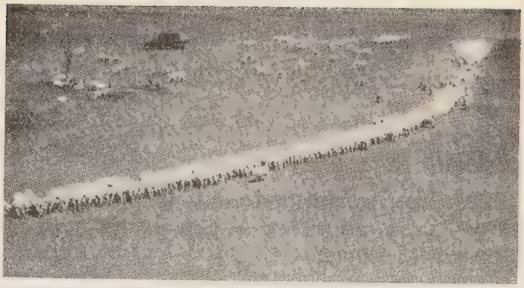

Plate 2

Drought Feeding Sheep with Wheat at a Longreach Property.

Wheat the Biggest Danger

Wheat stands high in the "risk-scale" when sheep gain access to unlimited quantities. Sorghum, maize, barley, oats, sheep nuts, all carry a danger, and it is apparent that stubble feeding, when unlimited and where a high proportion of unharvested grain remains, also carries risk.

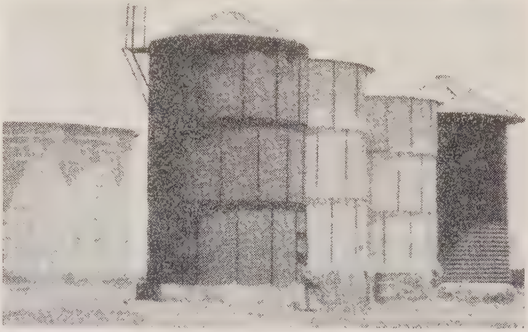

Plate 3

Grain Storage Silos in the Roma District.

Australian research workers carried out rials in which the toxicity of grains other han wheat were studied. Ground oats, barley, or maize were given to sheep in amounts that, calculated on starch content, were equivalent to he known lethal doses of wheat grain. All sheep developed acidosis, with low ruminal pH, high ruminal lactate, and high blood lactate, but variation was found in the degree of acidosis.

(pH is the standard of alkalinity or acidity. The range is 14, with 7 neutral. From 7 down o 1 is increasingly acid, and from 7 up to 14 is ncreasingly alkaline. Thus, strong hydrochloric acid might have a pH of 1, and strong caustic soda a pH of 14.)

Plate 4

Showing Visitors the Grain Silos on a Central Western Queensland Stud Sheep Property.

In these trials some sheep died, others gradually overcame the acidosis and recovered. Sheep which recovered were later killed by measured ethal doses of wheat grain.

Australian reports state that the lethal dose of wheat for a normal merino sheep is 75-80 grams per kilogram of body weight, whereas only 60 grams per kilogram of body weight is necessary to kill a sheep in poor condition. (That is 7½ to 8 lb. of wheat would cause acidosis conditions sufficient to kill a normal 100 lb. sheep, whereas a little over 3½ lb. of wheat would cause acidosis conditions sufficient to kill a poor 60 lb. sheep.)

Onset and Symptoms

Cambridge scientists found acidosis occurring within 12-24 hours of sheep being fed large quantities of wheat.

Hay was given to the sheep as an initial diet for at least a week before changing to a heavy grain diet. After starving for 24 hours following the hay diet, sheep were given large feeds of wheat, oats, or maize, which they ate in about six hours. When the pH of the rumen fell below 5, mild symptoms of acidosis, dullness, and lack of appetite occurred.

Below pH 4·5 severe acidosis symptoms occurred. These comprised dullness, lack of appetite, quickened respiration, dribbling of saliva, occasional grunting, and grinding of teeth.

Of 14 sheep fed on wheat, oats, or maize, eight died after intervals ranging from 25 to 65½ hours, and six recovered.

Australian field trials and reports of flock outbreaks of grain poisoning indicate that dullness, sheep going off feed, scouring, and lameness have all been observed as symptoms.

Antibiotics Help

Australian and Cambridge scientists found that some antibiotics administered to sheep that were fed large quantities of grain limited fermentation in the rumen. Gas formation and the fall of ruminal pH did not occur, and acidosis was prevented.

Drought Feeding Trials

A new South Wales research worker carrying out sheep feeding trials placed emphasis on the warning that care is needed in introducing sheep to grain and pellets because of grain poisoning risk. Pellets or nuts seem particularly likely to cause loss of sheep if fed in large amounts, as they are easily and quickly picked up by fast feeders. A change from pellets containing bran and pollard to pellets of grain caused losses. Oats were found to be the least risky. In these trials sheep were brought up to a full ration of wheat, fed once weekly, on the following plan:

SHEEP FED IN PENS

Days When Fed	Quantity	
1 and 2	4 oz. per head	Daily feeds
3 and 4	7 oz. per head	
5 and 6	10 oz. per head	
7, 8, and 9 . .	12 oz. per head	
10 and 12	24 oz. per head (1½ lb.)	
14 and 18	48 oz. per head (3 lb.)	
22 and thereafter . .	5½ lb. per head once weekly	

It was stressed that in paddock drought feeding, it is wise to take longer than this, starting off with lower levels, such as 2 oz. per head for several days. Even if intending to feed from self feeders, start off with a trail of grain. Watch the sheep and the droppings closely as the grain ration is increased. Cut down the ration if there are symptoms of going-off-feed, scouring, or lameness.

Sick sheep should be drenched with ½ oz. of sodium bicarbonate in 3 pints of water.

Mix Chaff with Grain

Where self feeders are used, mix chaff and grain, 50/50, and this will lessen danger of acidosis.

Field Treatment

The aim in the treatment of affected sheep should be to neutralise the acidity and to control further bacterial activity.

In affected flock sheep much good could be done by dosing with sodium bicarbonate as a drench, with ½ oz. of sodium bicarbonate in 3 pints of water.

With valuable sheep such as stud or flock rams, antibiotics might also be useful, and information on the use of these is available from veterinary officers of the Department of Agriculture and Stock.

* * *

New Wheats For 1960 Sowings

y J. HART, Senior Adviser in Agriculture.

A new strain of stem rust of wheat hit Queensland recently, damaging hitherto resistant arieties such as Gabo and Charter. It was very timely therefore that the Queensland Department f Agriculture and Stock should have had available at this stage two newly named rust resistant arieties, Kenora and Hopps, to take the place of those which have fallen by the wayside. These two varieties have been released by Mr. D. Rosser, the Department's Senior Plant Breeder, following many years of careful testing by Departmental officers both at Warwick and Toowoomba.

The release of Kenora and Hopps marks an epoch.

Hopps, the original cross of which was made y the late R. E. Soutter, is the last of the great ring of varieties with which the name of Soutter an be associated.

Queensland's wheat industry was virtually ounded on Soutter varieties like Puno, Puora, useas and Seafoam. It was fitting that Hopps hould have climaxed such a fine contribution to he wheat industry in Queensland's centenary ear.

It is equally appropriate that the release of enora, the first new variety wholly bred and ested by David Rosser, Mr. Soutter's successor, hould usher in our second hundred years of heat production.

Hopps—Dual Purpose

Queensland's wheat industry has always emanded at least one variety with the ability to rovide both good grazing and grain yields. Warput was an early dual-purpose favourite. In nore recent years Warput has been supplanted y Lawrence.

Lawrence is still the principal dual-purpose wheat in this State. In Hopps, however, growers now have an alternative selection.

Many growers have had a preview of Hopps. It is similar to the grazing wheat which farmers have been growing for some years under the name of "K 41". The latter name is quite incorrect. It would now be preferable for all farmers who have hitherto grown "K 41" to switch over to Hopps.

Hopps should be treated in exactly the same way as Lawrence.

To take full advantage of the characteristics of Hopps, the variety should be sown early, subjected to one, two or even three grazings and then reserved for a grain harvest.

Naturally, dual-purpose crops have a greater demand on soil moisture and nitrate reserves than have quick-maturing grain varieties. To obtain the full benefit of what Hopps has to offer, then, sow only on good fallows with ample reserves of moisture.

In 1958, on a long fallow following lucerne, Lawrence provided two heavy grazings and yielded 45 bushels to the acre with a grain protein of 14·3 per cent. to still win reserve championship in the State field wheat crop competition.

Hopps, given similar conditions, will perform as well, or maybe better.

Kenora At The Top

To Maranoa, Central Queensland and Darling Downs growers who remember Puora at its prime, Kenora will hold special appeal.

Kenora closely resembles Puora in appearance even to the extent of being similarly susceptible to loose smut.

Kenora is a quick variety. Along with Spica and Festival it provides a varietal trio which should satisfy the needs of most growers.

These three varieties, with Kenora at the top, have consistently outyielded old favourites like Gabo, Charter, Koda, Puora and Seafoam. On account of rust susceptibility alone, these latter varieties are now risky selections.

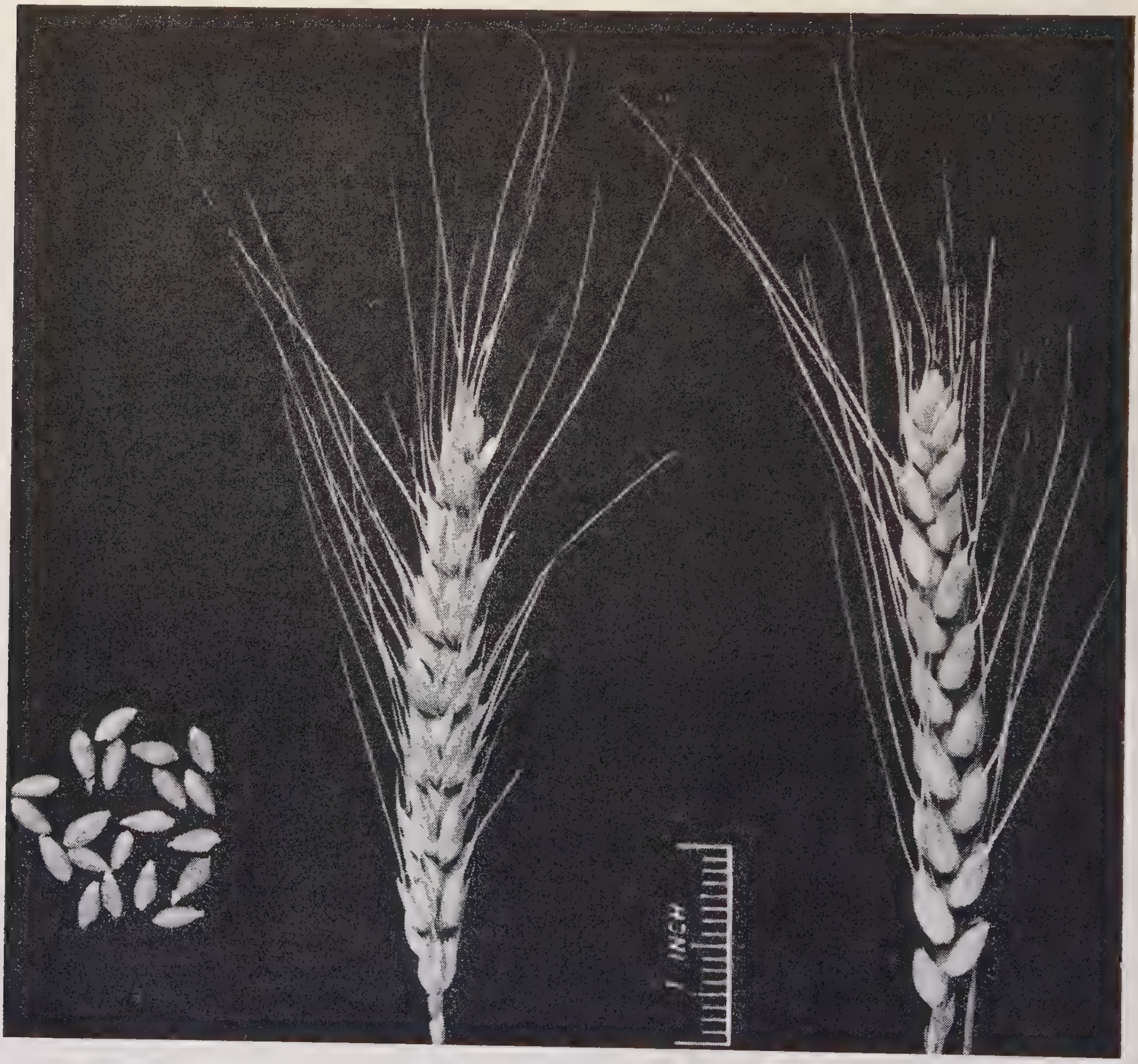

Plate 1

The New Wheat Variety, Hopps, Which Provides an Alternative to Lawrence as a Dual Purpose Wheat.

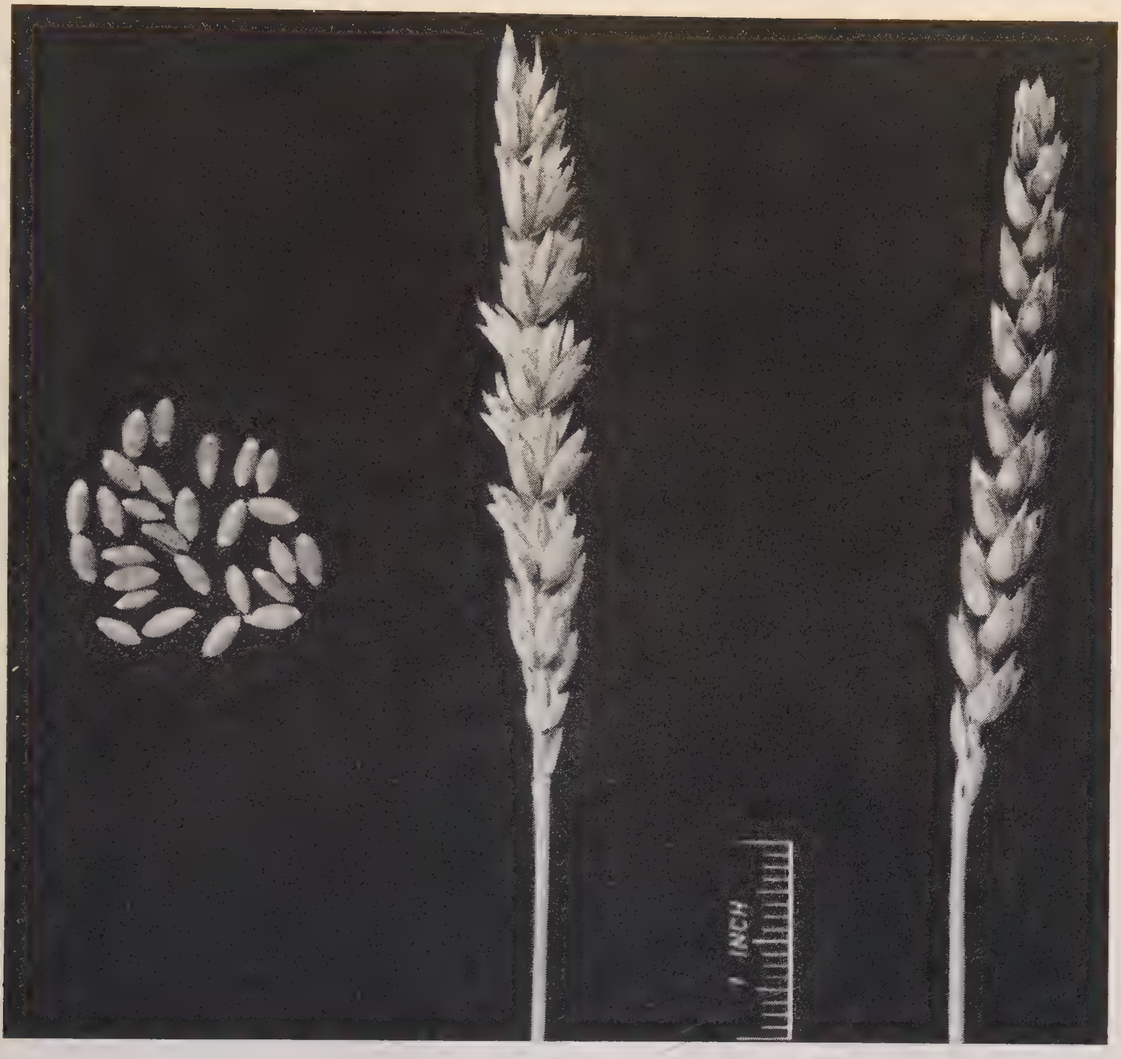

Plate 2

Kenora, a New Wheat Variety Intended as a Replacement for Gabo, Which, On Account of Rust Susceptibility, Is Now a Risky Selection.

The release of Kenora is intended as a replacement for Gabo. In appearance, however, these wo varieties in no way resemble each other. Kenora, with its tall, willowy habit, looks more ike Festival than any other modern variety. However, its smooth glumes, in contrast to the "velvety" glumes of Festival, will be welcomed y operators sensitive to "harvesting itch".

Kenora, as a quick maturing wheat, is a velcome replacement for Gabo and a timely addition to Spica and Festival as a safe, high-yielding grain variety.

Seed Supplies

Reasonable seed supplies of both Kenora and Hopps will be available to growers for the 1960 season.

Through the State Wheat Board seed selection scheme, high-quality seed supplies of all five varieties, Kenora, Spica, Festival, Hopps and Lawrence, can be offered.

pasture and crop

Paunch Content As Fertilizer.—There are a number of by-products of slaughter yards which can find use in agriculture. Among these is paunch content. Its value will depend on the type of feed on which the animal has lived for a week or so before slaughter.

Animals on grass roughage will produce a paunch content of low fertilizer value. Those on good food such as lucerne will produce one of somewhat better fertilizer value. Any paunch content will, like animal excreta, contain undigested weed seeds and could infest an otherwise clean field.

The degree of drying of paunch content is a factor in evaluating it.

The distance it will have to be carted is also another important feature as it is never of sufficiently high fertilizer value to warrant high cartage expenses, especially when wet as you will be paying cartage on water.

The paunch material will make a satisfactory mulch or, if ploughed in, will improve tilth and add a small amount of fertilizer to the soil.

It should be allowed to rot for a period before planting takes place.

Its value as a fertilizer is generally low and would warrant only a small outlay.

—*W. WINKS, Chief Chemist,*
General Analytical Section.

Stop That Raindrop Erosion.—A great deal of the erosion which occurs on cultivated land can be attributed directly to the pounding and puddling effect of raindrops on the bare soil. When the soil surface becomes puddled the intake rate is reduced and the resultant runoff water carries away the soil already dislodged by the chiselling action of the raindrops.

With the onset of the wet season, it is desirable to counter this risk by providing a protective blanket of crops or crop residues. It is a wise policy to avoid stubble burning and to preserve the crop residues as a surface mulch for the protection of the soil.

Where a long fallow is involved it is a good practice to plant a leguminous cover crop like cowpeas.

—*J. E. LADEWIG, Chief Soil Conservationist.*

Check Irrigation Equipment.—Hot, dry spells between summer storms call for irrigation to safeguard crops against setbacks through shortage of soil moisture. You may save yourself a lot of trouble by giving your irrigation equipment a thorough overhaul before irrigating.

A leaking footvalve is often a source of trouble. Ensure that the footvalve is clean and sufficiently clear of the bottom of the water supply to prevent mud and sand getting into the system.

It is essential for the packing gland to be water-cooled. Adjust this gland just tight enough to allow water to drip slowly. Belts should be inspected for tension and wear, and replaced if necessary. Direct couplings should be aligned to prevent undue wear. Pipes and sprinklers should be repaired or replaced if necessary.

—*I. N. McCLEMENT, Adviser in Agriculture.*

Summer Care of Irrigated Pasture.—A ground cover of 3 to 4 in. of leafy growth is the best protection for irrigated pastures against the killing heat of summer. Its insulating effect may reduce temperatures by as much as 30 degrees. Summer grazing should always be regulated to leave this important 3 to 4 in. of stubble.

Pasture studies over the years have shown that rye grass ceases to grow when the soil temperature is between 70 and 80 deg. High temperatures also severely retard the growth of the other pasture components.

With the insulation of 3 to 4 in. of leafy pasture, temperature of the surface soil seldom rises above 80 to 90 deg. But under close grazing, the surface soil may reach 120 to 130 deg. For this reason, a protective cover of stubble in the summer often makes the difference between survival and death for most irrigated pasture species.

Pre-Crop Irrigated Pasture Land.—Grow an annual crop on newly graded land before working up a seedbed for irrigated pastures. This will give a better stand of pasture than you'll get by planting immediately after heavy grading.

The main value of pre-cropping lies in developing uniform fertility and improving soil structure. In grading, some of the fertile topsoil is taken from the high spots and spread in the depressions. This disturbance of fertility will show up as patchiness in a pasture planted immediately after grading.

On the poorer soils, annual legumes like cowpeas, velvet beans and field peas will build up the fertility. On some fertile soils, the need for weed suppression may be greater than the need to improve soil structure and fertility. For these soils suggested crops are white panicum and giant setaria in the summer and wheat and oats in the winter.

—*A. NAGLE, Irrigationist.*

Protein from Irrigated Pasture

High-quality, protein-rich irrigated pasture is a valuable fodder, particularly in our dry winter and spring months when native pastures contain very little protein.

Mr. A. H. Gardner, Toogoolawah, has proved the value of spray-irrigated improved pastures in recent years. This pasture was sown in May, 1954, and is still a good pasture to-day. It now consists mainly of paspalum and white clover.

Losing Baby Chickens?

By P. D. RANBY, Veterinary Officer.

Deaths of chickens up to about one week old are often disconcerting to the chick rearer, and sometimes losses are staggering. In this article, the main causes of death in baby chickens are described and suggestions for their avoidance are made.

If you are losing chickens, find the cause. Don't merely pass the blame to someone else.

Were the chickens a good batch, or were they poor and uneven in size? Are they dying in what appears to be good condition? Or are they generally unthrifty? Was the hatchability satisfactory? These various answers are a useful guide in sorting out the problem.

The more likely causes of chick losses are as follows:—

- Chilling and overheating.
- Yolk-sac infection (omphalitis).
- Streptococcal infections.
- Salmonella infections.
- General unthriftiness and poor rearability due to faulty management before hatching.

In addition, numerous other diseases cause losses in chickens but are generally less important. Thus we may list epidemic tremor, chick nephritis, hereditary defects, poisoning by fumes and some nutritional disorders. There may even be others.

If you are losing too many chickens, veterinary assistance should be sought.

CHILLING AND OVERHEATING

It is well known that chickens chill easily. If subjected to cold, the chickens' lungs become congested so that they cannot function properly. Anyone rearing chickens should be conscious of the dangers of chilling.*

Remember, the chickens themselves will let you know if they are cold by loudly expressing their feelings of discomfort. A check should be made on the chickens at night in order to ensure that they are comfortable.

How Chilling Occurs

It is usually the inexperienced chick raiser who suffers heavy losses from chilling as a result of failure to keep the young chickens warm. Chilling can also follow from overheating. This may result when the infra-red lights are lowered too close to the ground (especially with the pyramid type). The radiant heat then has a burning effect underneath and the chickens are driven away into the "cold zone".

Even where the usual heating arrangements are supplied, chilling may occur when an electric bulb fails, or the chickens are subjected to cold draughts that carry away the warm air in the brooder. Chilling may also result where occasional chickens wander away from the rest of the flock gathered near the source of heat. "Cold-brooders" are not always reliable for baby chickens in cold weather and can be a source of trouble.

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* For information on this aspect, an article is available on request on "Brooding Chickens," Leaflet No. 78, by F. N. J. Milne.

If chilling is suspected, at least several chickens should be examined. Congestion of the lungs s regarded as typical of chilling. Instead of showing the normal light pink colour, the lungs become dark and solidified.

Both chilling and overheating can "trigger-off" bacterial infection. In these cases, deaths tend to persist. Harmful bacteria such as *salmonella* and *streptococci* may be present in a "latent" state without causing trouble. But when the chickens' resistance is lowered by chilling or overheating, a full-scale epidemic may be set in progress.

OMPHALITIS

Omphalitis (also called yolk-sac infection and navel-ill) refers to infection in the tissues around the navel, including the yolk-sac. A low incidence of omphalitis is often seen in batches of newly hatched chickens. Sometimes, however, 5 per cent. or more may be affected by the disorder. Chickens affected by omphalitis appear dopey, and may or may not have open navels. Deaths from the disease continue up to the eighth or ninth day of life and then cease. Deaths occurring after this age will be from other causes.

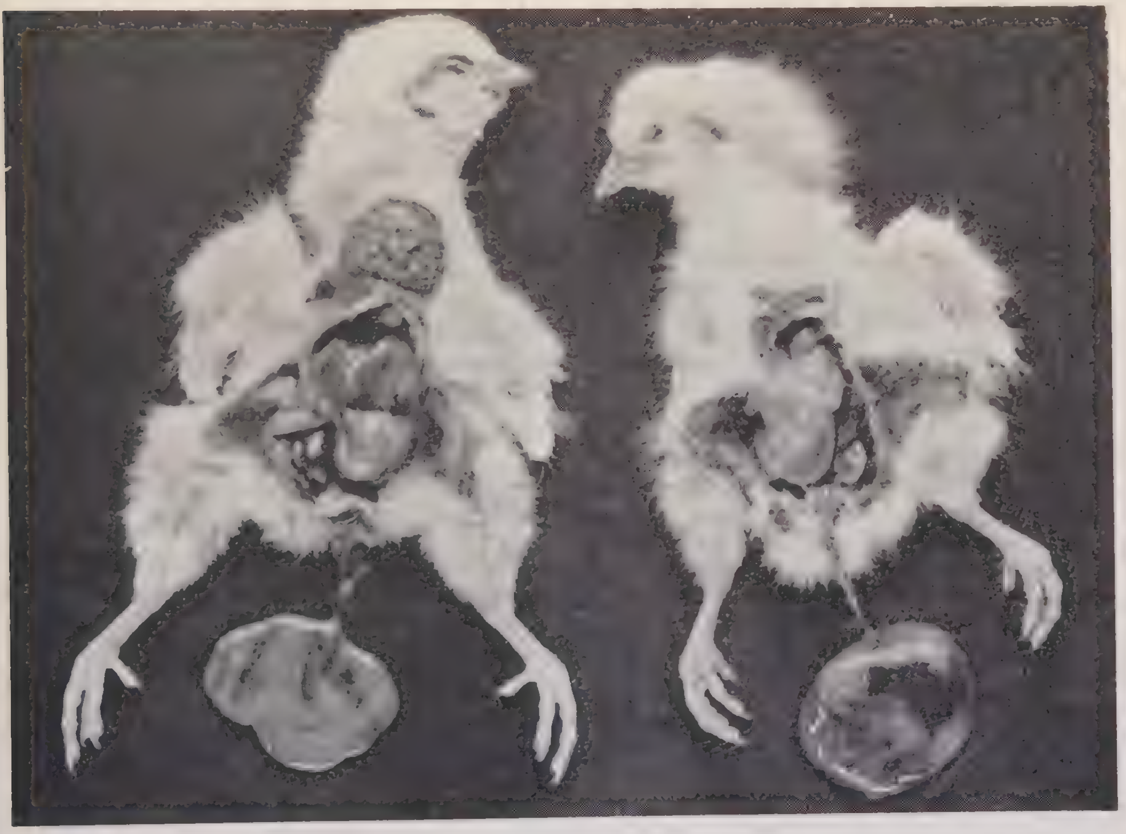

Plate 1

Omphalitis (Yolk-Sac Infection) in Two Chickens. The yolk-sacs have been brought to the exterior (seen between chicks' legs). Note attachment of the yolk-sac by a stalk to the small intestine. Both yolk-sacs contained broken down yolk which appeared as a dirty, brownish-yellow liquid. Note the dark area on the yolk-sac of the right bird—this denotes inflammation and haemorrhage in the yolk-sac membrane.

Broadly speaking, there are two types of omphalitis in young chickens:

- (*a*) Infection of the yolk-sac. Here, the yolk-sac is congested and flabby, and usually contains dirty, liquified yolk (see Plate 1). This is the usual type of omphalitis seen.
- (*b*) Inflammation of the abdominal wall in the area of the navel.

In older cases, the yolk-sac remains large because the contents have been unabsorbed. In a normal, one-week-old chicken, the yolk-sac should be pea-sized or less.

In both types of omphalitis, infection may spread to the cavity of the abdomen causing peritonitis. Such cases are often seen in chickens that survive longer.

How Infection Occurs

There is no single organism that is responsible for omphalitis, but coliform bacteria are the usual ones present. These organisms are common inhabitants of the intestinal tract of birds and other animals.

Bacteria may gain access to the abdomen in two ways:

1. (1) Through the open navel.
2. (2) Within the egg to the hatching chicken.

The egg-borne route of infection is not generally realised by farmers. Experimental work carried out some years ago in New South Wales showed that coliform bacteria can occur in the incubating eggs. Further, attempts to produce yolk-sac infection by contaminating the incubator with bacteria from cases of the disease failed. Dipping the eggs in cultures of the bacteria or swabbing the bacteria on the navels of newly hatched chickens likewise failed to induce infection.

This work indicated that omphalitis infection occurs before hatching.

Treatment

Antibiotics administered in the drinking water are worth trying. Oxytetracycline ("Terramycin") and Chlortetracycline (aureomycin) are the most readily available and may be given for about one week. Terramycin has been tried several times here and appeared to be of some value.

Chloromycetin in the drinking water gave promising results in an outbreak in the Brisbane area. Even dopey chickens appeared to respond and recover within 12 hours.

Hygiene Helps

(*a*) *Incubator Disinfection.*—Good incubator hygiene reduces omphalitis, and also early rearing losses in general.

The incubator should be washed or sprayed out before and after use with a suitable disinfectant. A chlorine disinfectant (as used on dairies) or a carbolic acid base disinfectant such as Lysol or Dettol may be used. All fluff and dust should be removed. Remember, cleaning of the incubator is most important and it is not sufficient to rely on fumigation alone.

During incubation, most hatcherymen fumigate the incubator with formaldehyde gas. This is usually carried out two or three days before the eggs are due to hatch. Another suitable time is between the third and fourth day after setting the eggs. Both times may be used. The formaldehyde gas is given off by adding potassium permanganate (Condys crystals) to formalin (which is a saturated solution of formaldehyde) in a suitable container placed in the incubator. One may follow the manufacturers' directions, which vary to some extent, but usually the quantity of formalin used is not sufficient.

Not less than 0·75 *ml.* (*c.c.*) *of formalin per cubic foot of incubator space is required* to obtain a good "kill" of bacteria and moulds in the incubator fluff.

Ten to 20 minutes of fumigation is required, after which the incubator doors are opened to expel the formaldehyde gas. The longer period of fumigation (20 minutes) is advisable in those types of incubators having air-vents.

Some hatcherymen dip the hatching eggs in a Dettol solution before setting them in the incubators, but the value of this measure is not known. Certainly it would kill off coliform bacteria deposited on the egg shell as a result of faecal contamination.

(*b*) *Other Points.*—Some poultry farmers blame dirty chick boxes for causing navel trouble, while some suggest excess humidity as a predisposing cause of omphalitis. We have no proof of the importance of these factors, but on the other hand, they cannot be rejected.

In the case of using the previous season's chick boxes, it should be sufficient to remove the straw and shake any dust from the box. The box may then be re-used.

Remember, despite all precautions, a low incidence of omphalitis can still occur. This brings us back to the question posed earlier, "Where does yolk-sac infection really start?" Further research is required on this point.

STREPTOCOCCAL INFECTION

Streptococcal infection in chickens appears to be more common than is realised. These bacteria are easily overlooked and probably many undiagnosed outbreaks of sickness in the past have been due to streptococci. In recent outbreaks in Queensland, the losses were associated with the presence of streptococci in the various internal organs. Deaths varied from 5 per cent. to 95 per cent. but were most often about 10 per cent.

In outbreaks of "strep." infection, losses start any time up to the sixth day of life and continue for a week or two. In one outbreak in the Brisbane area in which chickens from two sources were mixed, the infection appeared to spread from chickens of the first source (cross-breds) to those of the second source (Australorps). Chickens kept from the same hatch at the second source hatching were unaffected.

How the streptococcal infections originate is not known.

Stress Factors Important

Many of the "strep." epidemics in Queensland last year appeared to be associated with stress factors such as slight chilling, long journeys by rail and debeaking.

In the case of outbreaks after long rail journeys, chickens from the same hatch kept at the hatchery remained well. The latter had been supplied a high level of oxytetracycline (Terramycin) in the mash. Laboratory examination of these apparently healthy chickens revealed the presence of streptococci within them.

One outbreak started after debeaking. The chickens were debeaked when one day old. Deaths started two days later and continued for five days with 50 per cent. of deaths. The debeaking wounds showed excess "proud flesh" after debeaking. Debeaking was blamed for this outbreak on circumstantial evidence.

Recognizing Streptococcal Infection

There are usually no lesions found at post-mortem in chickens affected by streptococcal infection. In certain outbreaks some of the chickens have been found to have congested lungs, suggesting that the bacterial attack has been triggered-off by chilling. The alternative could also be possible—areas of lung congestion pneumonia could be a direct effect of the "strep.".

Bacteriological examination of sick specimens should always include a check for streptococci when baby chick losses occur.

Treatment

The tetracycline antibiotics Terramycin and aureomycin supplied in the drinking water for 7 to 10 days are recommended for streptococcal outbreaks. Sulphonamide drugs have given poor results when tried here, and therefore cannot be recommended.

In one outbreak at Maleny in 1958, injections of procaine penicillin appeared to be of some value. Losses were considerably reduced, however, for three or four days following the injections but the chickens then relapsed. These results suggest that the injections may have to be repeated to obtain satisfactory results.

SALMONELLA INFECTIONS

There are a large number of *Salmonella* organisms which cause infections in poultry. Two of these cause specific disease entities, namely pullorum disease and fowl typhoid. The remainder are generally grouped together and are referred to as "paratyphoid infections". We are mainly concerned with the paratyphoid infections. Pullorum disease is very uncommon in Queensland while fowl typhoid is confined to Tasmania and does not occur on the Australian mainland.

Paratyphoid Infections

The paratyphoid group of organisms are frequently found in the intestinal tract of birds in general. "Carrier" birds, which harbour the organisms, pass them on occasions in their droppings.

These organisms may be deposited on the eggshell during the passage of the egg through the cloaca (the cavity just within the bird's vent).

It is known that these organisms can penetrate the eggshell and infect the embryo but the importance of this has not been worked out. In any case, the infections spread after the chickens are removed from the incubator, being picked up from the droppings of the infected chickens.

Losses start to rise three or four days after hatching and may reach 10 per cent. to 30 per cent. of the flock. Many chickens become dopey and deaths are fairly rapid (see Plate 2).

If an outbreak has been in progress for 5 days or more, there is a tendency for the chickens to have "pasted vents."

Presence of the organisms is confirmed by bacteriological examination, using special growth media.

Pullorum Disease

Pullorum disease is very uncommon in Queensland—due, no doubt, to the rigid policy of testing all breeding flocks for "carriers" of the causative organism.

Pullorum disease has a number of features different from paratyphoid infections. The organism *Salmonella pullorum* is transmitted from the ovary of the infected hen through the egg to the hatching chicken. Rapid infection occurs within the incubator at hatching time by inhalation of infective down particles from the infected chicken. This explains the explosive nature of pullorum disease outbreaks immediately after hatching. Deaths of over 75 per cent. can be expected.

Treatment of Salmonella

1. The more recent drug, furazolidone, is the most effective one known against salmonella organisms in general. It is supplied as directed (0·04 per cent. of furazolidone in the mash) for 7 to 10 days. Caution: Furazolidone produces some testis degeneration in cockerel chickens but complete recovery is said to follow when medication ceases.

Furazolidone is not soluble in water but a very fine suspension of the drug in water should be available soon and should be suitable for administration in drinking water for poultry.

2. Terramycin or aureomycin may be used in the drinking water for 7 to 10 days. These antibiotics are more effective than the sulphonamide drugs but less than furazolidone.

3. The sulphonamide or "sulpha" drugs have often been used for salmonella infections in the past. Supplied in the drinking water, losses can be reduced. These drugs suppress the infection during the course of treatment but do not eliminate it.

Plate 2

Sick and Dying Chickens Only a Few Days Old. These chickens were affected by a Salmonella (paratyphoid) infection.

Change the Litter

During the period of medication, the contaminated litter should be replaced by fresh litter or else the chickens should be moved to new quarters. This measure, when combined with furazolidone treatment, has resulted in the complete removal of *Salmonella pullorum* in experimental infections.

GENERAL UNTHRIFTINESS AND POOR REARABILITY

Sometimes the newly hatched chickens may be unthrifty and uneven in size. In addition, early rearability is poor. Under ordinary conditions, one can expect 1 to 3 per cent. deaths to three weeks of age. However, when deaths reach 5 per cent. or more, there is some cause for concern. These losses are more or less non-specific—that is, they are not related to any immediate cause. Infection may be absent.

This type of setback will usually be associated with one of the following:

(*a*) Faulty incubation.

(*b*) Imperfect diet supplied to the breeding fowls.

The main factors involved are described briefly as follows:

Faulty Incubation

Excessive humidity towards the end of the incubation period will interfere with the respiration of the eggs and their contained embryos. The chickens hatching are smaller, appear wet and "mushy" and are inclined to be weaker. Panting is also a feature. Early rearability is reduced.

The humidity of the incubator during the last four days of incubation should be carefully watched by means of the wet bulb thermometer. The air currents are also important in controlling humidity.

Imperfect Diet

The chick's well-being in the first week of life can be affected by nutritional defects in the diet supplied to the breeding fowls. Often, the first sign of a nutritional deficiency is reduced hatchability and poor early rearability in the chickens hatched from these eggs. Deficiencies of vitamin A, riboflavin and manganese are the most notable in this respect. Probably poor protein quality in the breeder's ration can also result in unthrifty chickens being hatched.

Other Causes of Losses

Other disease conditions also account for chick losses, but are generally of less importance.

Chick nephritis (uraemia) is occasionally troublesome and is recognised by kidney damage. Affected chickens die quickly and may not be seen sick. The cause remains unknown.

Epidemic tremor (avian encephalomyelitis) causes nervous symptoms in chickens up to three weeks of age. The main sign is leg weakness and paralysis while a smaller proportion exhibit a peculiar fine tremor. This disease is caused by a virus which attacks the brain and spinal cord.

Congenital defects account for a few losses but the proportion is generally not higher than 1 per cent. unless the chickens are inbred. Examples are twisted beaks, a leg twisted sideways, and poor feathering. Possibly one or two slow growing and undersized chickens in an otherwise healthy flock are a result of biochemical faults that are inherited. Chickens with congenital defects are generally not sold. Preferably they should be destroyed.

Poisoning by kerosene fumes containing carbon monoxide may occur with improvised heaters. However, it is of note that the new kerosene pressure burners used by some poultry farmers appear to be efficient and safe.

Crazy chick disease has been observed once in chickens immediately after hatching. The outbreak occurred in the Brisbane area in 1959. The chickens showed a spastic paralysis and 7 per cent. died in a few days. Crazy chick is rarely seen before three weeks of age.

Vitamin A deficiency in the breeding stock, if severe enough, will cause heavy deaths in the newly hatched chickens. The chickens will continue to die for about one week despite the feeding of a vitamin A supplemented ration to them.

Debeaking of day-old Australorp chickens by the mechanical method sometimes causes a setback and they are slow to start eating. This does not seem to occur with White Leghorns or their crosses.

REMEMBER THESE POINTS

Keep chickens warm, as they chill easily. However, avoid overheating. Besides deaths caused directly from chilling, exposure to cold or excessive heat will lower the birds' resistance and "trigger-off" bacterial infections.

Good hygiene reduces omphalitis but does not entirely prevent the trouble. The navel route of infection is not the only one. It is generally not realised that the coliform bacteria may occur in the incubating eggs.

Salmonella and streptococcal infections can be responsible for heavy losses. Post-mortem findings are lacking but the organisms can be isolated from suitable live specimens. The newer treatments recommended are fairly effective, especially fo salmonella infections.

General unthriftiness and poor rearability i chickens may be due to faulty incubation or t an imperfect diet supplied to the breeding fowls

Less important causes of chick losses are chick nephritis, epidemic tremor, congenital or hereditary defects, and carbon monoxide poisoning Crazy chick disease has been seen immediately after hatching, an unusual time for this disease Mechanical debeaking of day-old Australorps may require caution.

Talking About Bees

More than 100 people attended the Beekeepers' Field Day held at Mr. Trevor Manning's apiary at Parkhurst in the Rockhampton district. Here, modern extracting equipment is being demonstrated.

Ear Notching Of Pigs

By Officers of the Pig Branch

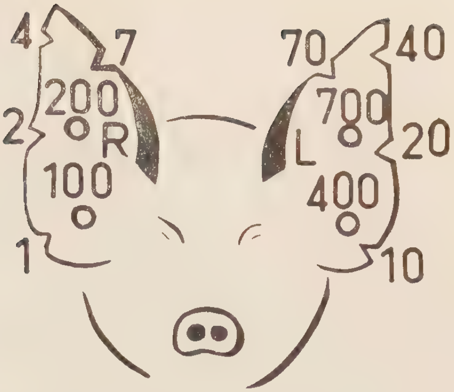

Plate 1

The Key or Guide to the Ear-Marking System.

BEFORE a litter is weaned, the young pigs should be given a permanent identification mark. Tattooing, tagging, and ear notching are common methods of identification, but of these the last-mentioned is undoubtedly the best and as nearly permanent as possible.

Notching has an advantage over tattooing in that it can be used on all breeds of pigs and if neatly done remains legible regardless of the pig's age. A pig's number also can be observed in the paddock without the necessity of yarding the animal and perhaps washing its ear.

Metal tags are not satisfactory, as they are often lost through pigs fighting or rubbing their ears against fences or other objects. With this method, also, the pig has to be yarded and the tags cleaned before the number can be read.

It is not claimed that ear notching is the perfect system of identification, for it is realised that pigs may occasionally tear their ears through fighting, thus marring the notches; their ears also may be disfigured by excessively deep and careless notching.

However, these risks may be reduced to a minimum if the following points are observed.

(1) No marks should be placed from the middle to the base of the upper edge of the ear. The cartilage in this position is quite thick and it is necessary to cut deeply into it to ensure that the notches will not grow out as the pigs age. As a result there is always a danger of the ear drooping over in an unsightly manner—a very objectionable feature, especially in show stock.

(2) The value or number allotted to positions near the point of the ear should be so designed that it is not necessary to take out more than one notch in this part of the ear for any number; otherwise the tip of the ear may droop.

(3) Round punch holes should not be used near the tip of the ear. In this position they are prone to cause tearing.

(4) Pieces removed from the ear should vary according to the size of the pig.

The ear notching system illustrated in Plate 1 has been designed to comply with the limitations as far as possible. It is one example of many systems in which notches in particular positions of the ears represent numbers, thus enabling each pig or each litter to carry a different number.

A brief description of this system, which employs both ears for notching, is as follows:—

All unit numbers are placed on the right ear and the tens in the left or near ear. Confusion between the two may be avoided by remembering that the words unit and right each contain the letter "i" and the words ten and left the letter "e."

It will be noted that numbers 1, 2, 4 and 7 are recorded by a single notch, the value being determined by the relative positions on the ear. The numbers 3, 5, 6, 8 and 9 represent a combination of the previous positions (for example, 2

SOW'S BREEDING RECORD

Name of Sow : "Sunnybrook Pearl XVI."
Breed : Large White

Date Farrowed : 3-7-53.
Earmark No. 65

Sire : "Sunnybrook Major II." Earmark : 32
Dam : "Sunnybrook Gem V." Earmark : 12

Litter Farrowed—	Sire of Litter	Number in Litter		Died at Birth		Date of Deaths before Weaning		Earmark and Date Weaned	Disposal of Litter											
									Date of Deaths after Weaning		Sold to Market									Remarks
											Date	Number		Average Weight	Price		Gross Return			
		Boars	Sows	Boars	Sows	Boars	Sows		Boars	Sows		Boars	Sows	Lb.	s.	d.	£	s.	d.	
2-9-55	Sunnybrook Major	7	5	1	1	..	1 3-10-55	65 29-10-55	..	..	28-3-56	5	2	140	2	0	98	0	0	1 pig born dead
								Boars Sows	..	..	10-4-56	1	1	136	2	0	27	4	0	1 pig overlain
								6 3												1 death—pneumonia
																				9 baconers marketed
																	125	4	0	

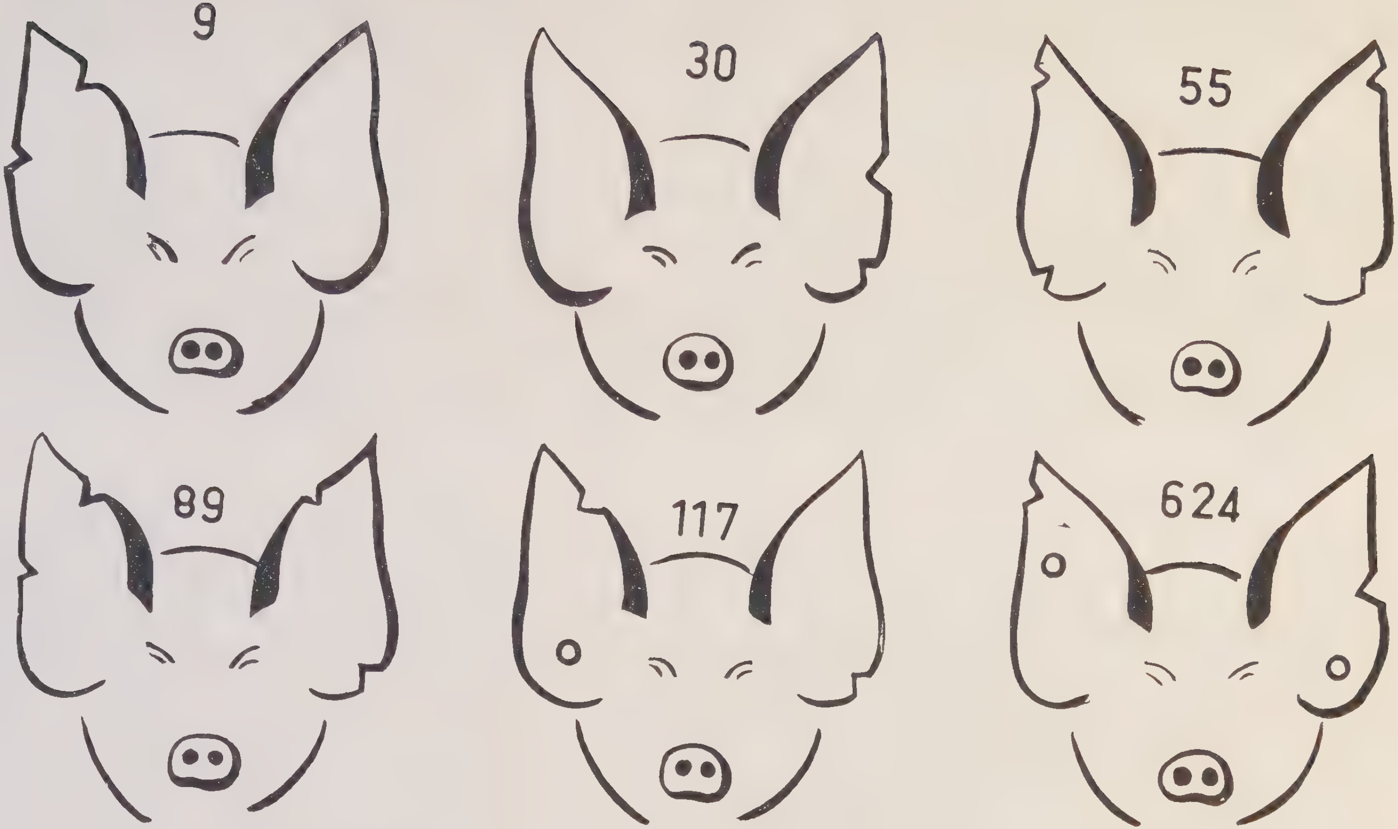
9
30
55
89
117
624

Plate 2

Diagrams Showing How Various Numbers Would be Marked.

and 1 to make 3; 4 and 1 to make 5; 4 and 2 to make 6; and so on). For these numbers it is therefore necessary to make two notches.

The tens are represented by notches in the left ear, the 10, 20, 40 and 70 positions corresponding to the 1, 2, 4 and 7 positions respectively in the right ear.

Any number up to 99 may thus be made by a combination of the above figures. If it is necessary to number beyond 99, round punch holes could be used as shown is the diagram, but in the average herd, where all pigs in the litter are given the same number, it is usually unnecessary to go beyond 99. By adopting the 1, 2, 4, 7 combination the number of cuts in the ear is reduce to a minimum. As the position of the notch on th ear determines the value, it is important tha positions 1 and 10 be kept well towards th bottom of the ear and positions 4 and 40 we towards the tip of the ear to prevent confusio with the positions 2 and 20 in the middle of th ear. Likewise these latter positions should be a nearly as possible exactly midway along the ea otherwise confusion may occur as between positio 2 and either position 1 or 4, and as betwee position 20 and either position 10 or 40.

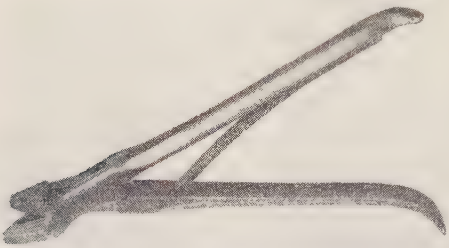

Plate 3
Ear-marking Pliers With a Cutting Piece Shaped Like a V Upside Down.

Pliers with a cutting piece shaped like a V o a narrow-bottomed U upside down are recommended for ear marking, as notches of variou sizes—according to the age of the pig—can b made simply by pushing the pliers varying distances on the ear. Small pigs up to weaner ag should have only a comparatively small piec removed from the ear.

Careful recording of the earmark allotted t each animal or each litter of pigs (see specime breeding record) is just as important as the marking itself, for one's memory should not be relie upon in these matters. Identification of pigs i this way is also of value in recording pedigree an performance.

* * *

Dealing with Humpyback

Rest is the best cure for "humpyback," a summer disease of sheep. Present evidence indicates that humpyback is caused by the animals eating the quena nightshade or wild potato plant that grows abundantly in many sheep-raising districts.

The disease is most common in January and February, but trouble may start as early as December or hang on well into March.

Wild potato is a small perennial plant about 9 in. to 1 ft. high. It tends to die back in the winter, but shoots up from its roots after the first summer storms. The plant has purple or blue flowers, and small fruit about the size of a cherry that turn yellow when ripe.

Sheep affected with humpyback stand with their backs humped, and tremble violently in their limbs. The trouble shows up mainly whe sheep are driven in hot weather.

Humpyback is a very real problem on man properties because it occurs during the shearin season, when the flocks have to be mustered.

If sheep with the disorder are driven, the usually collapse and die. But if they are allowe to rest, recovery is generally rapid. As t condition seems to be aggravated by heat, shearin will speed up recovery.

It is general practice to allow affected shee to drop out of the mob being mustered. Thes are allowed to rest, brought to the shearing she by truck, and shorn. Then their chances o recovery are good. If the outbreak affects a b portion of the flock, the sick sheep are be left and shorn later at a stragglers' muster.

—*R. B. YOUNG, Senior Adviser,*
Sheep and Wool Branch.

stock and station

Arsenical Poisoning From Dip Sump.—If you use a plunge dip to control cattle ticks, make sure your cattle can't drink from the dip's sump. A Brisbane district dairyfarmer lost cattle from this cause. After losses and sickness had occurred in his herd he found that, in the night, his cows were nudging aside a sheet of corrugated iron covering the sump of a plunge dip. This allowed them to drink the liquid in the sump which evidently contained sufficient arsenic to cause poisoning.

This farmer's experience contains a lesson for every stock owner. If the sumps of plunge dips were fenced off so cattle couldn't get at them, there'd be little danger of poisoning from this ource.

—*P. D. RANBY, Veterinary Officer.*

Vaccinate For Blackleg.—Annual vaccination of all calves is the best precaution you can take against blackleg. You can't afford to be complacent about this disease. Its incidence varies rom year to year and you never know when a widespread outbreak is likely.

The loss of only one calf would be more costly han many years' vaccinations. Vaccination is a imple operation. With a needle and syringe, c.c. of vaccine are injected under the skin, usually in the area immediately behind the houlder. Full immunity develops in about two weeks.

Treatment at five to six months gives protection ntil the beast is two years old. If calves under our months are vaccinated, they don't acquire a asting immunity, but require a second vaccination bout three months later. In severe outbreaks lder cattle may need another vaccination.

—*B. PARKINSON, Veterinary Officer.*

Sheep Die From Worm Treatment.—Many of Queensland's 22 million sheep graze in worm areas. Many are drenched several times annually. Sometimes because of careless drenching, sheep may be killed as well as the worms. Investigations show the main causes to be:

1. "Forced-pressure" drenching that sends fluid into the lungs.
2. Faulty drenching-gun nozzles that because they are sharp, hard, or unpliable, poke holes in the delicate throat linings.
3. Insufficiently supervised mixings of drench so that dosages are sometimes high enough to be lethal.
4. Trying to do too many sheep in a day.
5. Badly constructed and makeshift drenching races.

—*R. B. YOUNG,*
Senior Adviser in Sheep and Wool.

Peanuts Make Bacon Oily.—Farmers who feed their pigs on peanuts right up to trucking day run the risk of heavy financial loss. Factories pay a much lower price for peanut-fed pigs.

Carcasses of peanut-fed pigs do not become firm, even when chilled. If they are cured, the bacon is flabby and oily, and the fat melts at ordinary room temperatures. This type of bacon turns rancid quickly. Because of its messy nature and poor keeping qualities, bacon factories, retailers and consumers all object strongly to handling "peanut bacon".

Peanuts are good food for sows and litters and for weaners. But peanut feeding should be discontinued at least six weeks before pigs are marketed. This gives the pigs time to develop the firm fat necessary for a prime grading.

—*F. BOSTOCK,*
Senior Husbandry Officer, Pig Branch.

Worms Cut Pig Profits.—Wormy pigs are usually slow growers. They're likely to suffer from disease and earn farmers little, if any, profits.

The large roundworm is the most common worm parasite of pigs. Chief points in a control programme would be rearing all pigs on clean concrete floors at least to weaning age, and always using spelled paddocks for weaners. Prevent the formation of wallows, and ensure that food wastes and litter do not accumulate. Worm eggs remain infective much longer in moist areas and under rubbish than they do on dry ground and exposed to sunlight.

At the beginning and just before the end of each dry season, treat your breeding stock for roundworms. In addition, treat each litter just after weaning. Recommended drugs are sodium fluoride and piperazine compounds.

—*T. ABELL, Senior Adviser, Pig Branch.*

Coccidia In Chick Batteries.—Coccidia can build up in battery brooders under favourable conditions. Recent outbreaks of coccidiosis are reported in started chickens from battery brooders. Ordinarily, chickens reared on wire floors are relatively free of coccidia. But in the case of started chickens, the batteries are in constant use. Further, started chickens are often kept in the batteries longer than a month. Under these conditions, the ½ in. mesh wire floor of the brooder becomes less efficient and droppings collect. The chickens ingest the particles and the coccidial cycle is set in motion.

Where battery brooders are in constant use hose them out between batches of chickens. After hosing, any remaining coccidia may be killed by brushing with dettol or lysol solution. If possible don't keep the chickens in the batteries longer than a month.

—*P. D. RANBY, Veterinary Officer.*

Heat Spoils Eggs.—High temperatures can quickly turn a fresh egg into a stale one. To prevent this happening, you should collect eggs from the nests at least three times a day, cool them rapidly before packing, pack them in cool cases and then store them in a cool place.

As well as being kept cool, the eggs must be kept in a humid atmosphere to cut down evaporation of the egg contents. If eggs are placed in a drying breeze, rapid evaporation takes place, and the air cell is enlarged. This will lead to the egg's being down graded.

A charcoal cooler will provide the necessary cool humid atmosphere in which to store your eggs prior to marketing. This type of cooler is inexpensive to build and costs nothing to run but it could save you losses due to down-graded eggs this summer.

Plans for a charcoal cooler can be obtained from your local poultry adviser.

—*B. W. MOFFATT, Poultry Adviser.*

* * *

Feeding Feathers to Chickens

A poultry farmer at Wowan (via Rockhampton) asks, in a letter, if feathers fed to chickens will prevent cannibalism and feather-eating. Both these vices have been a problem in his broiler chickens.

He states that since he recently started feeding his chickens feathers from slaughtered birds, cannibalism and feather-eating have disappeared. The ration supplied to the birds has remained the same, apart from the feathers.

It is accepted that ground-up feathers can control both feather-eating and cannibalism. This effect is probably brought about by the increase in the indigestible material in the bird's diet as a result of feeding the feathers. However, the same effect should occur if extra lucerne chaff, lucerne meal or ground oats are given to supply extra fibre.

Our correspondent may have found an answer to his problem through feeding feathers but his results indicate a lack of fibre in the broiler ration. It may be worthwhile comparing feathers with say, good quality lucerne chaff or meal. (Oats are not usually available in his area.)

Remember, the causes of cannibalism and feather-eating are multiple and include boredom overcrowding, nutritional imbalance and hot humid conditions. High energy-protein diets increase the tendency.

An article entitled: "Cannibalism and Feather Eating in Poultry" is available in the December (1959) issue of this journal and will soon be obtainable in pamphlet form on request. In this article, the control of this disorder is more fully discussed.

—*P. D. RANBY, Veterinary Officer.*

Crookneck In Pineapples Is Not Hard To Control

By N. L. ALDRIDGE, Adviser in Horticulture.

Special fertilizer has been compounded to combat crookneck in pineapples.

The disorder known as crookneck in pineapples is common in the more important horticultural districts of Southern Queensland. It is particularly well-known in areas where the crop is grown on sandy soils which tend to be strongly acid and are rather deficient in two trace elements —zinc and copper.

Lack of available copper appears to have an adverse effect on the utilisation of the zinc by plants and, even when supplies of zinc are adequate, signs of deficiency of this element can occur when the amount of copper in the soil is below normal. If the zinc content of the soil is also low, as seems to be the case in many soil types in coastal Southern Queensland, the aggregate effect on the pineapple plant is the development of the disorder which we call crookneck.

What to Look For

The symptoms of crookneck are often not very spectacular in the early stages. The first indication of the disorder is usually a curling or twisting of the heart leaves. Later, the leaves become typically narrow, light-green to yellow in colour with a thickly-waxed surface. In acute cases, the twisted centre leaves are bunched together and bend over towards the horizontal, giving the plant a typical crookneck appearance.

An unusual feature of this disorder is that some plants are badly affected while others, even those alongside, may show no abnormalities in growth.

Effect of Soil Type

Due to the rapid expansion in the pineapple industry during the post-war years, pineapples are now being grown on a wide variety of soil types. These include the peat and sandy-peat soils which originally carried a wallum, semi-wallum or sparse forest type vegetation. These soils are usually well-supplied with organic matter, poorly drained and nearly always acid or strongly acid in reaction. They are frequently deficient in both copper and zinc. Pineapple crops established on them are very subject to crookneck unless corrective measures are applied before or shortly after planting.

Crookneck is also common in plantations established on sandy, well-drained soils which are often lacking in organic matter and very subject to leaching of plant nutrients by heavy rain.

In pineapple crops grown on heavier-textured soils, which were originally covered with dense forest or scrub, the disorder is not so prevalent but deficiencies may sometimes appear when the land has been cropped with pineapples for several years.

How to Control It

Crookneck is not difficult to control. Although outbreaks are usually associated with the occurrence of a double deficiency of copper and zinc in the soil, a deficiency of copper alone is sometimes the cause when the status of this element is very low and available zinc is just sufficient for normal growth.

Special fertilizers have been compounded to combat the disorder. The best known is a 10-6-10 mixture containing about 56 lb. of copper sulphate and 56 lb. of zinc sulphate a ton. Copper and zinc salts are also included in certain planting mixtures currently recommended for the pineapple crop. These fertilizers are commonly known as "Special" mixtures and are retailed as such by fertilizer firms.

Plate 1

Healthy Pineapple Plants. These were grown from tops and are about 6 months old.

When crookneck plants are found in the plantation, one of the "Special" mixtures should be applied when the crop is next due to receive a side dressing of fertilizer.

Rates of application are standard at 50 lb. a thousand plants.

Normal growth is resumed very quickly after treatment if rain falls soon after the fertilizer is applied.

Symptoms of the disorder commonly appear in spring when a flush of growth occurs in the plantation. This may involve the substitution of the "Special" mixture for one of the standard fertilizers prescribed at this period of the year.

Under normal conditions, one application of the fertilizer would correct the disorder. If, however, heavy rains occur shortly after using it and the plants do not respond within a reasonable time, it may be necessary to make a second application later on.

In some districts, the "Special" mixture is applied on the more readily leached types of soil as a routine control measure in spring, on the assumption that crookneck symptoms will appear at that time of the year.

In areas where copper and zinc deficiencies are pronounced and the land has a crookneck history, an application of the "Special" fertilizer mixture containing these elements is made in all crops at or shortly after planting. Unless the deficiency is acute, this should keep the plantation free from the disorder during the cropping cycle of one plant crop and one ratoon crop. However, if symptoms again become prevalent later on during the life of the plantation, the "Special" mixture can be substituted for one of the routine fertilizer treatments.

In some areas, growers claim good results with the "Special" fertilizer incorporated in the soil as a basal dressing before planting rather than as a side dressing after planting. This practice seems justified by recent experimental work at the Maroochy Experiment Station which indicates that the whole of the phosphorus and potassium requirements of the crop can be effectively applied in the basal dressing.

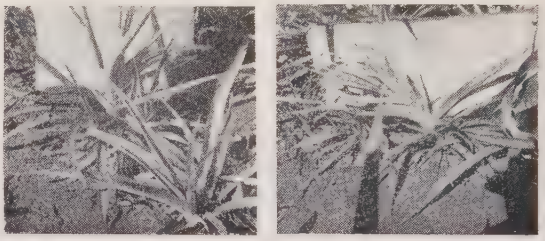

Plate 2

Pineapple Plants Showing Typical Symptoms of Crookneck. Left—early stage, note curling of the leaves at the growing point; right—advanced stage showing growing point bent to near-horizontal position.

Take This Precaution

When using the "Special" fertilizer containing copper and zinc, take care to prevent the mixture coming into contact with the heart leaves of the plant as it is liable to burn more than standard mixtures which do not contain sulphate and zinc sulphate.

Propagating The Grape Vine

By D. E. TAYLOR, Adviser in Horticulture

While the grape vine may be propagated from cuttings, layers or seeds, commercial propagation, that is, volume production of plants for new vineyards, is invariably achieved by using selected cuttings.

The raising of plants from seed is not a commercial practice; it is, however, employed by plant breeders who are interested in producing new varieties Layering also has a limited use, mainly as a method of replacing vines which have died or collapsed in an established vineyard.

Cuttings are selected from mature canes of the previous season's growth and are cut from the parent vine during the dormant season. They are taken from vines which are vigorous, true to type, free from disease and regularly productive of heavy crops of good quality fruit. Vines of this type should be marked during the growing period so that they can be identified in winter when cuttings are prepared.

Cuttings are prepared immediately after pruning. The cane is first cut directly below a node and again just above a node some 15 to 18 in. nearer the tip. Each cut should be clean so that the exposed surfaces will callous over quickly.

The better type of cutting is moderately thick with fairly short internodes and is obtained from the lower portion of the cane. If the source of supply is large enough, selection can be restricted to cuttings from canes with basal buds and dormant eyes at the end. Such canes immediately adjoin old spurs.

The cuttings are placed in bundles of about 50, and buried in soil to a depth of about 6 in. until they are required for planting. They keep best in a cool, sandy soil that is damp but not wet, and protected by shade.

An alternative method of holding cuttings is to heel them in the soil at an angle to the surface leaving the top 3 to 4 in. of the bundle above ground level.

Planting Bare Cuttings

Although cuttings can be planted in the vineyard, it is, nevertheless, much better to let them root in the nursery first. If they are established direct in their permanent positions, some failures are almost inevitable and replacements in the vineyard are rarely satisfactory

Where, however, bare cuttings are planted in the field, the work is done in late winter. A bar is sunk to a depth sufficient to take the cutting, which is then placed in the hole with one bud at ground level and one bud above the ground. The bar is again inserted into the ground a short distance from the cutting, this time at an angle, and the soil is then forced towards the cutting in such a way as to seal the hole completely from the base up. The second hole made by the bar can be filled in by tramping.

If the soil is dry at the time of planting, it will be necessary to water the cuttings. The cutting is placed in the hole made by the bar; the hole is then filled with water and firmly closed by hand after the water has soaked into the soil.

Two cuttings may be set in each vine position. If one fails to grow or makes poor growth, the second will provide a replacement vine in the right place.

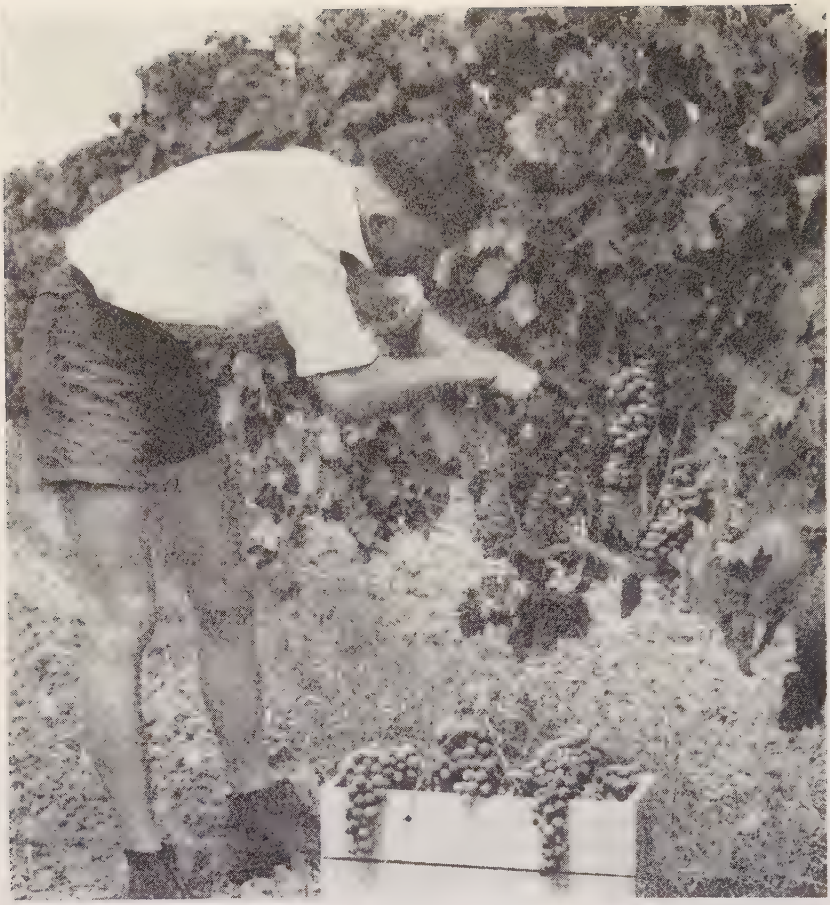

Plate 1: Muscat Hamburg, an Early-Maturing Grape Which Is Popular Both at Stanthorpe and on the Coast. It is normally propagated on its own roots.

Rooting the Cuttings

Cuttings are normally rooted in a nursery, the site of which must be chosen very carefully. New land is essential and the soil should, preferably, be a well drained, sandy loam of good depth and reasonable fertility.

The soil should first be worked to a fine tilth by ploughing and harrowing. The nursery rows are then marked out by plough furrows in which the cuttings are set in late winter at an angle of 45 deg. to ground level with two buds above the surface. The furrows are then filled in and the soil is well firmed. If the soil is at all dry, the cuttings must be watered before the furrow is completely filled in.

During the following season, the soil should be kept continuously moist, by irrigation if necessary. Weed growth must be suppressed at all times and diseases such as anthracnose and downy mildew must be controlled by suitable fungicides.

Rooted Cuttings

Rooted cuttings are carefully lifted from the nursery and prepared for planting into their permanent places in the vineyard during the dormant season—about 12 months after they were bedded in nursery rows. The roots should be neatly trimmed; long roots are shortened back and lateral roots at ground level are completely removed. All damaged roots should be trimmed back to healthy tissue.

After lifting, the rooted vines should be covered with a damp sack and planted immediately in the vineyard. Each vine is set at the same depth as it was growing in the nursery.

When planting the vines, a long-handled, round shovel is a useful tool. A more or less square hole a few inches deeper than the length of the vine is made to receive the plant. A "spit" of loose earth is placed in the bottom of

Plate 2

Rupestris du Lot, a Phylloxera-Resistant Rootstock Frequently Used at Stanthorpe to Confer Vigour on Waltham Cross and Purple Cornichon Grapes

the hole and the vine inserted with the roots spread out and evenly spaced. A small quantity of soil is placed over the roots and firmed down by hand. A second lot of soil placed in the hole can be lightly rammed after which the hole is filled in.

It is a good plan to water-in the rooted vines, when the hole is about two-thirds filled with soil.

After planting, the most vigorous upright shoot on each vine is headed back to two buds and all other growth is removed. The young vine is tied with string to the bottom wire of the trellis and the new growth is trained up the twine. In this way, a straight main trunk can be obtained. If the young vine is not properly trained, the canes tend to sprawl on the soil where they are very subject to disease and mechanical damage.

Grafted Vines

Vines may be propagated either on their own roots or on phylloxera-resistant stocks. In the few localities where this aphid has been recorded a resistant stock such as Rupestris du Lot or 3306 should always be used.

However, in phylloxera-free districts such as Stanthorpe, resistant stocks are used to promote vigour in varieties such as Waltham Cross and Purple Cornichon, which seldom thrive on their own roots in the Granite Belt. The types mainly used for this purpose are Rupestris du Lot and 3306.

Phylloxera-resistant stock cuttings are rooted in the usual way and cleft-grafted when 12 months old, with selected wood of the scion variety.

How To Control Major Pests Of Apples And Pears In The Granite Belt

By M. BENGSTON, Entomologist.

Many pests of apples and pears in the Stanthorpe district must be controlled if orchardists are to obtain profitable yields.

Biological and cultural controls minimise the importance of some of these pests, but successful control of the majority depends mainly upon thorough and properly timed pesticide spray applications.

For correct timing growers must be able to recognise the pests and have some knowledge of their general and seasonal behaviours. Those of major importance are:

CODLING MOTH

The larvae or grubs of the codling moth enter the fruit and tunnel to and feed upon the developing seeds and surrounding tissues. Damaged fruit usually fall from the tree.

During spring the moths emerge from cocoons spun by over-wintering larvae under bark, in crevices on the trees, amongst refuse in the orchards, or amongst cases and packing material in or near the packing sheds. Eggs are deposited singly on the trees, and these give rise to the first generation of larvae which attack the newly formed crops.

Larval development is complete by early summer, cocoons are then spun, and moths again emerge in midsummer.

No exact time can be given for this emergence, which depends to some extent on weather conditions. It may occur between mid December and early February, but usually in early January.

In some seasons there may be a third generation.

For many years the Department has advised orchardists of the most appropriate times for spraying. This information should of course be used according to the requirements for each orchard, as moth populations may vary from orchard to orchard, depending on the efficacy of earlier control measures.

Several insecticides are used elsewhere for codling moth control, but 0·1 per cent. DDT applied at peaks of moth activity, has proved the most efficacious in the Stanthorpe district

LIGHT-BROWN APPLE MOTH

The light-brown apple moth, although closely allied to the codling moth, has different habits It does not have a particular overwintering stage but breeds slowly through the winter on available hosts. A wide range of hosts, including apples pears, grapes, apricots, plums, peaches and lupins is attacked.

Infestations in fruit trees usually follow egg-laying on the younger leaves of leaders and terminal growth. The newly hatched larvae feed on the foliage tissues, and spin leaves together

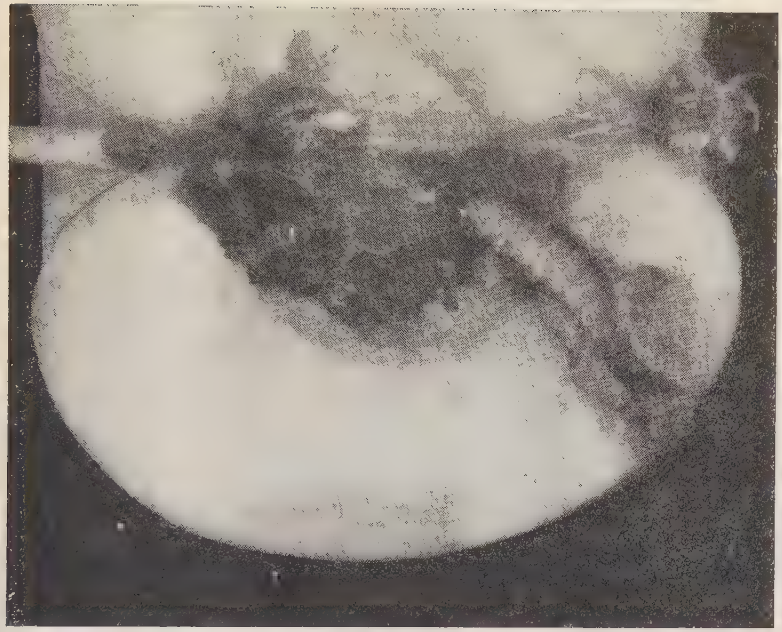

Plate 1

Codling Moth Larva Tunnelling in Fruit.

to provide shelter. Later, as populations increase, feeding becomes more general, and when fruit are attacked the larvae gouge out areas of skin and underlying tissues beneath touching leaves or between adjacent fruit.

Feeding is confined usually to the surface tissues, and burrowing into fruit seldom occurs.

Though generally of less importance than codling moth, the light-brown apple moth may cause considerable damage in some seasons. Timely applications of 0·1 per cent. DDD will control this pest. These are made to coincide with the likelihood of larval damage in the new growth.

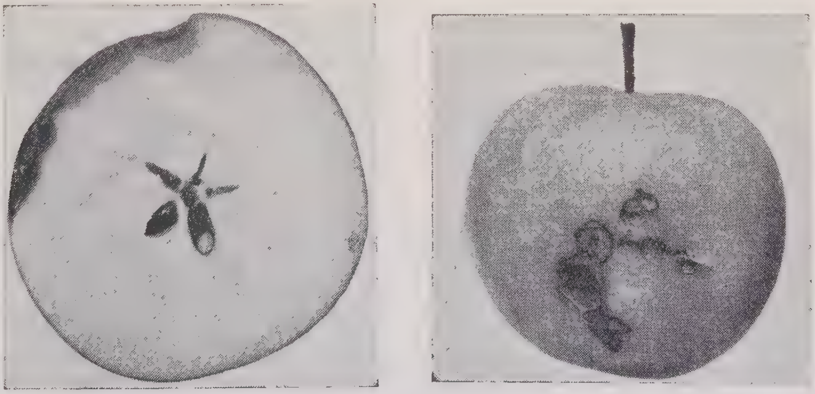

Plate 2

Light-brown Apple Moth Damage to Fruit. Note that the injury is superficial.

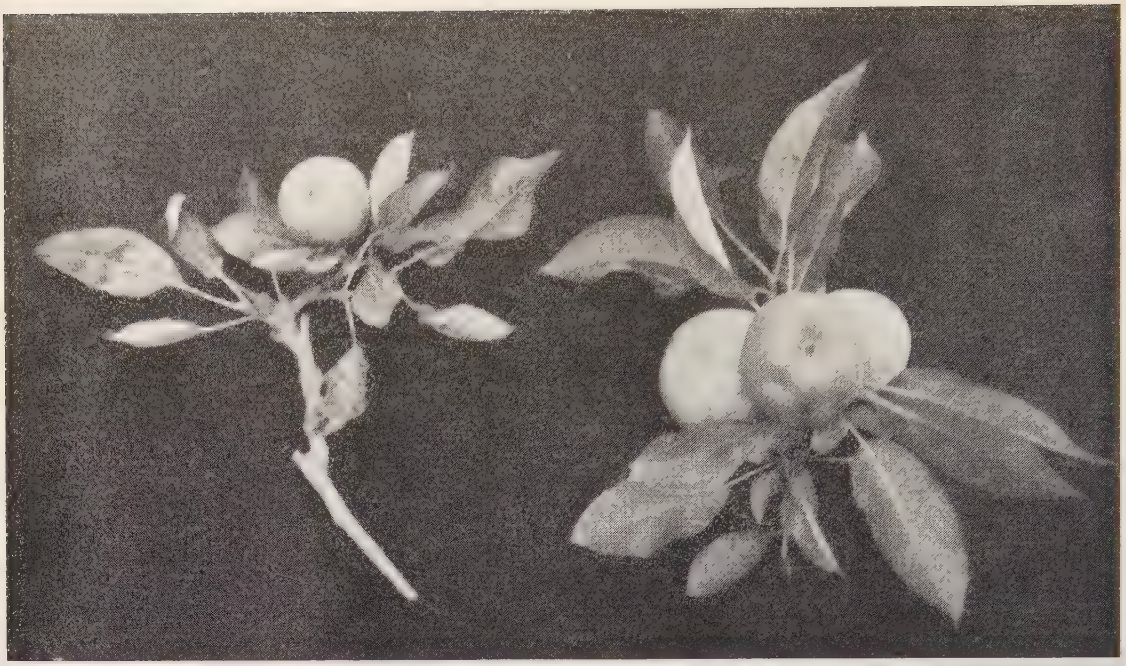

Plate 3

Mite Injury. Spurs of Delicious apple show severe infestation at left and, at right, no infestation.

MITES

Mites feed by piercing the surface tissues and extracting sap from the underlying cells. The first symptoms of damage occur on the older leaves both inside and towards the base of the tree. The normal green colour of the leaves is destroyed in the vicinity of feeding punctures and the result is a yellow mottling of the foliage.

With the more susceptible varieties, Delicious and Winesap, severely injured leaves eventually redden, and areas of tissue may die.

Leaf shedding is not uncommon, and growth may be arrested. When mites are numerous, normal colouring of the fruit may be prevented, particularly in the red varieties.

The pear leaf blister mite causes a somewhat different type of damage by feeding inside the host tissue, producing characteristic reddish-brown blisters on young leaves and fruit.

Six mites are associated with apples and pears in this district. All except red spiders overwinter on the tree, bryobia and European red mite as red eggs, pear leaf blister mite and the other eriophyids as adults in the buds.

For the control of these mites which overwinter on the trees, winter sprays are basic, that is dormant lime sulphur for pear leaf blister mite and winter oil for the remainder.

Red spiders, on the other hand, overwinter either as orange-coloured adults at or near the bases of the trees or as the green summer forms on a wide range of plants. Because this species moves back to the trees in the spring, winter sprays are ineffective.

Summer sprays of kelthane 0·05 per cent. are recommended, one in late November and another in early January. On pears and early apple varieties, only the first spray is required. These sprays will also control other mites surviving from the winter sprays.

WOOLLY APHID

The aphelinus parasite and the use of resistant rootstocks have reduced the importance of woolly aphid. It is still important, however, on trees ith seedling rootstock, particularly where sprays educe the parasite population. Hail damage ommonly causes a build-up of this pest.

Woolly aphid overwinters on both above and elow ground parts of the trees, and in early pring may be found on the spurs and old pruning uts. Under favourable conditions this pest apidly increases in numbers, spreads to new rowth and causes a characteristic galling of tems. Growth may be checked, and fruit and ranches covered by a sticky secretion from the aphid. Sooty mould develops rapidly on this ecretion and lowers fruit value.

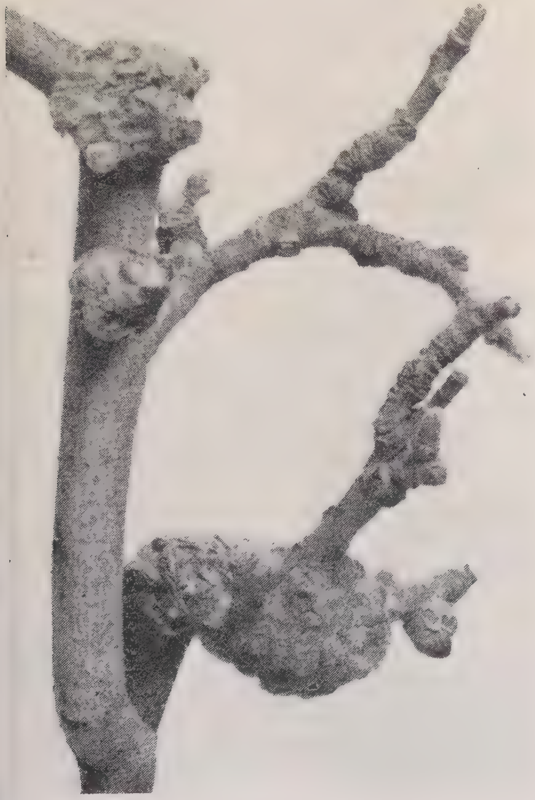

Plate 4

Twig and Spur Galling Caused by Woolly Aphid.

Winter oil partially controls this pest. Where heavy infestations persist and this usually concerns only a few trees in an orchard a BHC spray (0·1 per cent. gamma isomer) should be applied just prior to green tip.

FRUIT FLY

The general and widespread use of DDT for codling moth control, together with suitable harvesting arrangements, have reduced the importance of fruit fly as a pest of apples and pears. In years favourable to fruit fly, however, losses may occur to early and mid-season varieties in orchards where DDT has not been used during the summer months.

Furthermore, the likelihood of damage by this pest increases in late summer after DDT applications for codling moth control have ceased.

Growers should be prepared therefore to take measures against fruit fly for the protection of late-maturing varieties.

No fixed rule can be laid down concerning the possibilities of fruit fly attacks, as populations will differ greatly from orchard to orchard. The use of the lure traps will provide growers with definite information on the need for preventive spraying.

Six to 10 traps should be hung singly in leafy trees away from the direct rays of the sun. They should be placed in position well in advance of the expected date of harvest. The results from regular inspections will indicate the timing of control measures.

A reliable stock lure formula is:

10 oz. pulped orange
½ oz. rock ammonia (ammonium carbonate)
1 pint water

An equivalent quantity of other soft fruits may be substituted for the orange. This stock lure will store for several months in a well-stoppered bottle if a preservative is added. To charge the traps, 1 part of stock lure is mixed with 30 parts of water.

DDT sprays, applied soon after fly activity has been demonstrated by trapping, will minimise damage by this pest. A partial cover spray of 0.2 per cent. concentration can be used, although a 0·1 per cent. spray will suffice when populations are small, or when jointly used for codling moth control.

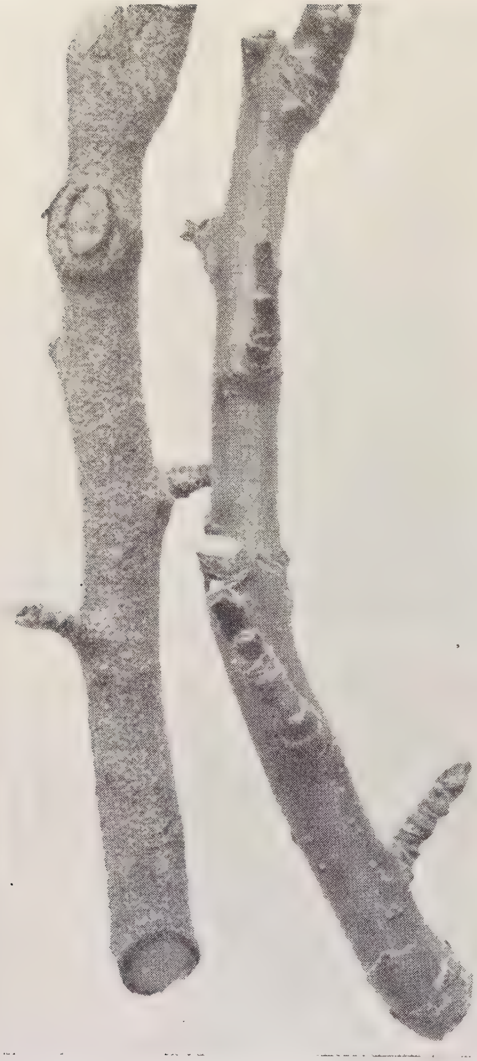

Plate 5

San José Scale. Apple twigs showing, at left, heavy infestation, at right, no infestation.

SAN JOSÉ SCALE

San José scale is potentially a serious pest but populations are normally held at low levels by the routine winter oil spray. The pinhead-sized grey scales may attack bark, leaves or fruit, but are most commonly noticed on the bark, where large numbers cause a scurfy appearance. This scale multiplies rapidly and severe infestations will kill leaders, and even entire trees.

SPRAY PROGRAMMES

It is impracticable to draw up a comprehensive and entirely effective spray programme to satisfy requirements in all orchards. Pest populations, spraying machinery and the standard of spray application vary considerably and the orchardist must regulate his programme accordingly. The following, with codling moth control as the basis, will serve as a guide, and with minor modifications can be adapted to suit conditions in most Stanthorpe apple and pear orchards:

Apples

Times of Application	Pests	Spray Formulae
Late July—early August	Scales, mites, woolly aphid	Superior oil 3/100 gal. or Dormant oil 5/100 gal. (or defer until green tip)
Green tip . .	Scales, mites, woolly aphid	Superior oil 3/100 gal. or Semi-dormant oil 5/100 gal. (if oil not previously applied)
Calyx stage . .	Codling moth, light-brown apple moth	Arsenate of lead 3 lb., and Hydrated lime 3 lb. in 100 gal. water
Early November	Codling moth	DDT 0·1%
Late November	Codling moth, Light-brown apple moth	DDT 0·1% DDD 0·1%
	Mites . .	Kelthane 0·05%
Mid-December	Codling moth	DDT 0·1% (if codling moth active)
Early to mid-January	Codling moth, Mites	DDT 0·1% Kelthane 0·05% (required only on susceptible varieties in a dry season)
Late January–early February . .	Codling moth, Light-brown apple moth	DDT 0·1% DDD 0·1%
As indicated by trapping	Fruit fly . .	DDT 0·2% (sweep spray)

Pears

Times of Application	Pests	Spray Formulae
ate July— early August	Scales, mites, pear leaf blister mite	Superior oil 3/100 gal. Lime sulphur 10/100 gal.
reen tip ..	Scales, mites	Semi-dormant oil 5/100 gal. or Superior oil 3/100 gal. (if oil not previously applied)
alyx stage ..	Codling moth, light-brown apple moth	Lead arsenate 3 lb., and White oil 2½ pints in 100 gal. water
arly November	Codling moth	DDT 0·1%
ate November	Codling moth, Light-brown apple moth Mites ..	DDT 0·1% DDD 0·1% Kelthane 0·05%
id-December	Codling moth	DDT 0·1% (if codling moth active)
arly to mid-January	Codling moth, Light-brown apple moth	DDT 0·1% DDD 0·1%
ate January	Codling moth	DDT 0·1%
s indicated by trapping	Fruit fly ..	DDT 0·2% (sweep spray)

Scientific Names of Pests and Parasites

phelinus parasite ..	*Aphelinus mali* (Hald.)
ryobia mite	*Bryobia praetiosa* Koch
odling moth ..	*Cydia pomonella* (L.)
riophyid mites ..	*Eriophyidae*
uropean red mite ..	*Panonychus ulmi* (Koch)
ruit fly	*Strumeta tryoni* (Frogg.)
ight-brown apple moth	*Austrotortrix postvittana* (Walk.)
ear leaf blister mite	*Eriophyes pyri* (Pgst.)
ed spiders	*Tetranychus telarius* L. and T. *lambi* Pritchard and Baker
an José scale ..	*Quadraspidiotus perniciosus* (Comst.)
oolly aphid	*Eriosoma lanigerum* (Hausm.)

Strawberry Clover

If your farm is in a “clover district”, plant trawberry clover in the wet patches in your asture and you'll get good forage instead of eeds.

Wet patches in a pasture can be a serious roblem, especially when they are fairly big. These patches reduce the carying capacity of the paddock and become breeding grounds for weeds that may spread into the rest of the pasture.

Strawberry clover is not a new pasture plant in Queensland. It has been tried for many years and has proved its ability to adapt itself to most soils where other clovers will grow. It makes its main growth in spring and early summer, producing heavy yields of good quality feed. It has done well in many coastal and near-coastal districts.

A peculiarity of strawberry clover is that it shows a liking for wet patches on heavy soils and for land subject to flooding. It will also stand up quite well to dry conditions and tolerate soils with a moderately high salt content. The plant has an upright habit of growth and can compete with the taller grasses. Another valuable property of strawberry clover is its ability to cover the ground quickly by sending out long runners that root at each node. Unlike most other clovers, it seeds only in November and December. It seeds heavily and will regenerate well from self-sown seed. It can also be propagated from runners.

Sowings can be made from early autumn until as late as July. Seed is fairly expensive and for this reason the planting rate should be kept as low as possible. Good results can be obtained from a sowing rate as low as 1 lb. to 2 lb. to the acre.

—*W. J. WHITE, Senior Adviser in Agriculture.*

The Fight Against Disease.—VI.

Husbandry Helps To Prevent Loss

By G. C. SIMMONS, Senior Bacteriologist

DISEASE prevention and control is part of the practice of good husbandry methods. Inevitably poor husbandry will result in economic loss and wastage from lowered production and deaths. For example, a frequent finding in the diagnostic laboratory is the presence of many diseases on farms which are grossly overstocked.

Disease prevention may add to cost of production but it is a sound investment that will return high profits.

Management of Livestock Movements

A herd or flock is usually owned for production of primary products such as meat, milk or eggs. Less frequently it may be solely a producer of pedigree stock. In either case, farmers may exhibit their stock or may vary the number in the herd or flock to suit fluctuation in market prices, feed supply or to introduce new genetic lines. All these activities mean that diseases may be introduced. This is contrary to the ideal state of completely and permanently closed herds to which disease is unlikely to be introduced.

In both human and animal fields many examples may be quoted where a disease has become rampant following the introduction of an infected individual.

The value of a closed community is realised by quarantine officers and is the basis for our quarantine laws preventing the introduction of possibly infected animals into Australia.

Farmers should seriously consider, therefore, the risk involved in the movements of animals onto their properties and if possible adopt husbandry practices to avoid the necessity for introducing stock. If introduction must be done, good husbandry involves thorough check of the incoming animal for disease by skilled veterinary examination and laboratory checks if possible. Secondly, there should be a pen or yard isolated from the main herd where the introduced animal can be held in isolation until tests are completed and a period has elapsed during which the animal has shown no abnormality caused by disease. It is desirable that such isolation areas be built so that they can be thoroughly disinfected or so that they may be spelled for a long period after the animal has been taken from it. Case histories of disease outbreaks have shown that travelling or other stress factors may light up an infection not previously known to be present. For instance, salmonellosis often occurs in sheep after long rail or road journeys. Needless to say, support should be given to those authorities of Show and Breed Societies who insist on certain tests to indicate freedom from disease. If one infected animal is housed in a show ground with numerous other animals the infection may spread rapidly throughout valuable stud stock farms.

Livestock Nutrition

It is generally considered that the adequately fed animal is better prepared to resist infectious agents. In poultry, for instance, respiratory diseases are frequently associated with poor feeding. Dietary deficiencies that cause cattle to eat bones will increase the chances that they will have botulism. Nutritional requirements for disease resistance may not be the same as those for best production but the chances are that if the diet is not good enough for disease resistance, it is not good enough for good production.

The actual quantity and quality of feed is not the only point to consider. Variations from time to time must also be considered. Particularly in intestinal infection sudden changes in diet may alter the normal intestinal micro-flora and temporarily lower the animal's resistance to infection.

Under the heading of nutrition must be considered whether an antibiotic supplement or anti-parasite drug should be included and if so at what level and for how long it is to be fed. Drugs to prevent coccidiosis in poultry are now commonplace and antibiotic supplements in pig feeds are becoming more widely used. Important also is the provision of adequate clean water supply, not polluted by rotten carcasses or vegetation.

Livestock Management

Farmers are constantly faced with the possibility of disease outbreaks. A number of husbandry practices are directly anti-disease measures. Such practices include vaccination and treatment procedures and the splitting of the herd to decrease the risk of infection between animals.

The control over vaccines is such that few of doubtful value are marketed. Vaccines such as *Brucella abortus* Strain 19 have been proved effective and the outlay involved in having animals vaccinated is more than returned by elimination of loss if uncontrolled infection is present. Prompt treatment usually means that less infective agents are shed into the environment. Consequently there is less risk of other animals becoming infected.

Included under livestock management are the husbandry practices used to prevent transmission of disease from one animal to another. Such practices include the isolation of sick animals or those animals which are healthy but which are carrying the infection. It is desirable, of course, that such carrier animals be sold for slaughter as they are a danger to all the non-infected ones. Where such a policy has been adopted as in the eradication of pullorum disease of chickens, the industry has reaped great benefit. Spelling of areas and movement of animals at regular intervals may often be the answer to disease prevention just as crop rotation is desirable to maintain soil fertility. Some diseases affect more than one animal species. The practice, therefore, of running pigs and calves together results in many cases in the transfer of infections such as leptospirosis from calves to pigs or vice versa.

Farm Management

Finally there is the question of planning a farm to aid disease preventon practices. To mention two points: the siting of drains from pens and yards, provision of adequate shelter to counter adverse climatic conditions.

Also under farm management is stressed the necessity for farmers to obtain expert advice not only when animals die but also on the preventive measures possible.

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Advisory Leaflets

As well as from the Queensland Agricultural Journal, which is published every month, Queensland farmers and graziers may secure useful information in another handy and durable form. This is the advisory leaflet. And it would be fairly correct to say that there is an advisory leaflet available today on every important aspect of every branch of primary production.

Most of the information in these leaflets is first published in the Queensland Agricultural Journal and is then reprinted in leaflet form for free distribution.

The leaflets are not printed in excessive numbers, because printing costs are high these days, so producers are asked to apply for specific information only.

Those who are interested in sheep or cattle, dairying, agriculture, or fruit growing, will find that there are leaflets covering most aspects of their work.

So, if you have a problem in your farm or station work, write to the Department of Agriculture and Stock and ask if there is an advisory leaflet on the subject. If there is one, you will get it free of charge, and it might well save you pounds.

Anaplasmosis Of Cattle

How To Identify It, And What To Do About It

By B. PARKINSON,
Divisional Veterinary Officer.

If you suspect your cattle are affected with tick fever, but you are getting no response to treatment, anaplasmosis may be the problem. Or if you have inoculated for tick fever and reactors occur at about the fourth week, your bleeder may have picked up anaplasmosis.

This article describes anaplasmosis, how it can be differentiated from other tick fevers, and what you can do about it.

A LARGE area of coastal Queensland is infested with cattle ticks. Ticks are the carriers of organisms which, in susceptible cattle, cause tick fever. Most cattlemen in ticky country are familiar with the disease, tick fever, which is more commonly called "red-water." Anaplasmosis is a tick fever, but this disease does not produce the symptoms of red-water shown by the other two causes of tick fever, referred to technically as babesiosis. For simplicity, babesiosis will be called red-water in the text.

Cause

Microscopic organisms found within the red blood cells are the cause of anaplasmosis. Two such organisms are known to occur. *Anaplasma marginale* produces the severe type of disease encountered in the field. *Anaplasma centrale* causes a milder upset, but is never found in field cases.

Spread by Cattle Tick

The cattle tick appears to be the sole vector (carrier) of the disease in Australia. Consequently the disease is confined to the tick-infested areas of Queensland and northern Australia. It has also been recorded in the tick-infested area of northern New South Wales.

In America, other vectors such as horseflies, stableflies and mosquitoes are known to transmit the disease. However, as no cases have ever been recorded outside the tick-infested areas in Australia, it is considered that other insects do not transmit the disease here.

The organisms are perpetuated in ticks and in cattle by what is known as transovarian transmission. The red-water type of tick fevers are perpetuated in this way also. This means that the resultant progeny of fully engorged adult female ticks dropping off carriers or clinically affected cases may be infective. Such larvae, on attachment to susceptible (non-immune) cattle, will transmit the disease to them.

This is the only natural means of spread in Australia. In America, the biting insect vectors transmit the disease mechanically by transfer of blood from infected to susceptible cattle.

Many Cases Unrecognised

Anaplasmosis does not occur to the same extent as other types of tick fever. It is rarely that an explosive outbreak is experienced. Little is known of the full incidence, as probably many cases go unrecognised, and losses or sickness are just put down as tick fever.

Generally, the disease is experienced only when susceptible animals are introduced onto properties where carriers exist. Mostly these introductions come from tick-free country, as in the case of stud cattle. These are readily susceptible, and as most are valuable animals, here the disease is of considerable economic importance.

Cases also occur in cattle which have been reared in ticky country. There are many properties on which the disease has never occurred, but on which the cattle are immune carriers. Cattle reared on these properties acquire a natural immunity in the same way as they do to red-water.

Again there are some properties in tick-infested country on which the cattle must be considered to be non-immune, having never been exposed. The incidence of infested to clean properties in Queensland is not known, but it is probable that the disease is present in a latent form in most of the tick-infested country.

In ticky country, it is the usual experience to encounter only an odd case of the disease at the one time. More severe outbreaks have occurred where cattle have been moved from one ticky property (apparently non-immune) to another, where carriers exist.

The disease has also been spread by tick fever inoculation, where the "bleeder" has apparently been infected.

These are the Symptoms

Symptoms are not so acute as with red-water. Affected animals lose condition fairly rapidly, with dairy cows showing a marked drop in milk production. The appetite is decreased and the beast is visibly sick. The temperature rise is not usually so severe as with red-water, fluctuating from 103 to 105 deg. F. (106 to 107 deg. in red-water). Examination of the mucus membrane of the eye or breeding passage will show the intense pallor of anaemia, due to the destruction of red blood cells. The yellowish discolouration of jaundice is also usually present.

The disease generally is a lingering one with marked emaciation. Affected animals may be sick for several weeks before death or recovery.

The incubation period of anaplasmosis is much longer than that of red-water. Under natural conditions, it is usually about 4 to 5 weeks after exposure before symptoms commence. By inoculation, this period may be reduced by a week or so.

What Post-mortem Shows

The main changes shown by post-mortem are indicative of anaemia and jaundice. The blood is extremely watery, and all internal organs are pale. The yellowish colour of jaundice can be detected throughout the body. The liver and spleen are greatly enlarged and the gall bladder is distended with thick green to brown, viscous bile.

Confusion with Other Diseases

Anaplasmosis can readily be confused with other diseases, namely, other tick fevers and leptospirosis. Often differential diagnosis in the field is quite difficult and one has to rely to some extent on history.

Differentiation from red-water is mainly on account of its more chronic nature. Cattle affected with anaplasmosis rarely die within several days and usually deaths are the result of the supervening weakness of emaciation. In contrast, most cattle affected with red-water are either dead or on the way to recovery within several days.

Probably most cases of anaplasmosis are suspected when there is a failure to respond to the specific treatments for red-water. If the urine can be observed, the absence of reddish discolouration at the height of the sickness tends to eliminate red-water. The longer incubation period in anaplasmosis often gives a lead to the differentiation of this disease also.

It is more difficult to differentiate from leptospirosis unless there are a number affected. The degrees of anaemia and jaundice are usually greater with anaplasmosis than with leptospirosis.

Laboratory Aids to Diagnosis

Microscopic examination of blood smears from an affected beast nearly always reveals the presence of the causative parasite in a distinctive form within the red blood cells. These parasites can be readily distinguished from those causing red-water. Thus the field officer, if he is uncertain, has a reliable laboratory diagnostic aid to assist him in diagnosis.

In a dead beast, examination of smears taken from the liver and kidney will reveal the parasite. The diagnosis can then be readily confirmed.

This is the Treatment

Anaplasma parasites are not susceptible to the red-water specifics (drugs used especially for the treatment of red-water). Thus such drugs as Acaprin, Babesan, Pirevan and Piroparv have no effect on the course of the disease.

In recent years, the tetracycline group of antibiotics has been found to be effective in the treatment of the disease. Oxytetracycline (Terramycin) has been used in the field in Queensland. Its use should be confined to early cases (where good results may be expected) before there is too much loss of condition.

This drug is available only to veterinary surgeons, and as treatment is rather expensive, it should not be used indiscriminately. A dosage of 2 milligrams per lb. body weight, by injection into the muscle, is recommended.

For valuable animals, supportive treatment by blood transfusion is desirable. Intravenous injections of dextrose and saline solutions are also helpful. Sick animals should be well nursed, and given good feed to hasten recovery.

Immunisation

Immunisation is a well-recognised method of controlling red-water. It is possible to adopt similar lines to control anaplasmosis.

Anaplasma centrale produces a much milder reaction than the naturally occurring *Anaplasma marginale*. Thus inoculation of cattle with blood containing the former parasite will produce a mild reaction, but immunise the animal to the more severe natural infection.

Some years ago, all bleeders issued from the Animal Health Stations contained *Anaplasma centrale* as well as the two red-water parasites. Thus inoculation of blood from these bleeders could be expected to give immunity to all tick fevers. Owing to the very low incidence of anaplasmosis, the anaplasma parasite in bleeders was left out for many years.

However, in the last few years there have been occasional losses from the disease. A demand for immunising blood rose again and stock owners, on special request, can now be supplied with blood containing *Anaplasma centrale*. It is generally recommended that this blood be used only on known infected properties, such as for inoculation of herds where the disease is occurring. Many owners also desire to inoculate any introductions, particularly stud animals, if they have experienced the disease before.

Macadamia Harvest

A thriving macadamia nut industry can be built only on confidence between growers, processors and consumers. The growers' contributions towards this confidence are production of good quality crops and harvesting the nuts in the proper condition for processing.

First job in preparation for the macadamia nut harvest is to remove last season's nuts and fallen leaves from under the trees. This simple job is easily overlooked. But if it is done properly, the new season's nuts are easily gathered and the sample is free from sub-standard nuts left over from the previous crop.

Shortly before nut-fall, the outer husk splits. This is the first indication of maturity. When the nuts start to drop, weekly harvesting is necessary to give the grower a uniform line in much the same stage of development. Nuts left lying on the ground from week to week deteriorate rapidly, especially in wet weather.

In the packing shed, husks are removed and the nuts are allowed to dry out under cover for about three weeks. They should then be graded for both size and type before being marketed. Ungraded nuts are unpopular because of difficulties involved in cracking them, and the uneven size and quality of the kernels.

—*J. McG. WILLS, Senior Adviser in Horticulture.*

The Answers To 20 Questions On Herd Recording

y **S. E. PEGG, Chief Adviser (Herd Recording).**

GROUP Herd Recording has been functioning in Queensland since 1948, but there are nany farmers who still do not understand how t operates.

In order to outline briefly the working of the cheme, and some of its uses, a list of 20 pertinent uestions has been set out together with the nswers.

Should a dairy farmer require any further pecific information, he should communicate with is local departmental officer.

Question: What is herd recording?

Answer: Herd recording is a service provided or the dairy farmer to enable him to obtain ccurate information in regard to the quantity nd quality of the milk produced by the individual ows in the herd.

H.R. POINTS
TO BEST
BREEDERS

Question: How is it organised?

Answer: Herd recording is operated by the Department of Agriculture and Stock. Dairy farmers wishing to have their herds recorded make application to the local dairy officer, who allocates them to a Herd Recording Group when a vacancy occurs. Each group, which operates in a restricted area, consists of 20 herds.

Question: What are the advantages?

Answer: Herd recording is essential to the progressive dairy farmer. It enables him:

(*a*) To cull low-yielding cows which are unprofitable.
(*b*) To breed from animals known to be good and regular producers.
(*c*) To gauge the worth of each bull used.
(*d*) To feed according to yield.
(*e*) To check on various farm practices.

Accurate information in regard to yield is essential for carrying out these five practices; and this information can only be obtained by herd recording.

Question: Who does the work?

Answer: The recording work is carried out by men, known as herd recorders, trained and employed by the Department of Agriculture and Stock. A recorder is allocated to each Herd Recording Group. The work involves the weighing of the milk of the individual cows at the evening and morning milkings once a month, and the testing of that milk for butterfat content. The recorder also ear tattoos all heifer calves so that the owner has positive proof of their identity when they enter the milking herd.

H.R. AIDS IN
KEEPING DOWN
COSTS

Question: Are recorders supervised?

Answer: Yes. Recorders are supervised by the local Dairy Officer. These officers pay regular visits to all the recorders within their areas. They supervise the recorders' work and submit reports to the head office of the Department of Agriculture and Stock.

Question: Who supplies the apparatus, stationery, and so on?

Answer: All equipment is supplied and maintained by the Department of Agriculture and Stock. The recorder conveys all the necessary equipment from farm to farm. The equipment includes vacuum buckets, which are attached to the milking machine to collect the milk from individual cows, thus obviating the necessity to revert to hand milking. All stationery is supplied free of charge by the Department of Agriculture and Stock.

Question: Has the herd owner any forms to fill in?

Answer: The entire recording work is carried out by the herd recorder.

Question: What is expected of the herd owner?

Answer: The herd owner must:

(*a*) Provide overnight accommodation and meals for the herd recorder on each occasion of a visit.

(*b*) Make sure each cow is identifiable.

(*c*) Keep records for each cow in respect to dates of mating, drying off and calving on special sheets provided for this purpose.

(*d*) Furnish the herd recorder, when each cow comes into test, with the name of the cow, tattoo markings, pedigree, age, date of calving, and so on, and see that these particulars are entered correctly on the herd record sheet.

H.R. TELLS
WHICH COW
TO CULL

Question: Must the herd recorder be accommodated with the herd owner?

Answer: No. It is not essential that the recorder should be accommodated with the herd owner. It is the responsibility of the herd owner to provide accommodation with either himself or one of the farm staff, or if this is not possible, at some convenient point, provided always that the accommodation is within easy reach of the farm.

Question: How often is the herd visited?

Answer: At intervals of 30 days. If this is not possible, the visit should be from 25 to 35 days after the preceding visit.

Question: Does the herd owner receive prior notice of the recorder's visit?

Answer: In order that accommodation may be available it is customary to advise the herd owner a few days before the date of the visit.

Question: How are cows identified?

Answer: Cows may be identified by tattoo numbers, numeral, fire or acid brands, or numbered tail tags. In small herds where all cows are known by name no such method is required.

Question: Must all cows be recorded?

Answer: Yes. Under the rules, all cows yielding milk in a herd must be submitted for recording. This is required for the following reasons:

(*a*) Records of lifetime production are the only reliable guide to a cow's capabilities and should be used when planning a breeding programme.

(*b*) Herd recording provides a comparison of the yields of cows in the same herd. The recording of a portion of the herd would not provide such comparisons.

(*c*) When surveying sires, it is necessary to compare the productions of the bull's daughters with the records of the rest of the herd. These records must have been made during the same year.

H.R. GIVES
ACCURATE
FACTS

Question: Do the yields ascertained by recording represent the actual milk and butterfat produced by the individual cows?

Answer: No. To do this it would be necessary to weigh the milk at each individual milking, and under an official scheme this would be impossible. Costs would also be prohibitive. The aim of any herd recording scheme is to give herd owners an indication of the production of the individual cows as near to the actual as possible. Monthly tests have been found to give a close approximation to the total milk produced during the lactation period. Tests carried out have shown that the difference between the actual yield and the calculated yield is negligible.

Question: What happens to the records?

Answer: At each test, the herd recorder uses a shed book in which he enters the yields of individual cows as regards weight of milk and percentage of butterfat. After the weighing and testing have been completed, the yields of milk and test of the individual cows are entered on a monthly herd record sheet. The amount of butterfat for the day is calculated for each cow entered on the sheet, as also is the production of milk and butterfat for a 30-day sub-period. One copy of the record sheet is given to the farmer and one forwarded to the Department of Agriculture and Stock, Brisbane.

When the record sheet is received at the Herd Recording Office all entries are checked for accuracy, and corrections made where necessary. The record sheets are then coded with respect to breed and sire, abnormal tests, and so on. The information on the sheets with respect to each cow is then punched into cards prepared for use in special accounting machines. From these cards the total daily production of the herd is compiled by the machines. This enables the daily average production for each herd to be ascertained. The cards are next used to calculate, and type, the progressive total production of each individual cow in the herd.

H.R. SHOWS
THE BEST
MILKERS

A copy of this is forwarded to the herd owner and enables him to see how long each cow has been milking and her production to date.

Cows which have dried off are given an average butterfat test. The average daily production for the testing day is shown on the progressive production sheet. At the end of the herd recording year (September 30) the herd owner is given a list of lactation productions for all cows in age groups, together with the average production for the whole of the herd. He is also supplied with the results of a survey of his bull or bulls, which indicate whether the bulls are raising or lowering production in the herd.

Question: What is the cost to the recording herd owner?

Answer: The cost of recording is shared by the herd owner, the State Government, and the Commonwealth Government. The proportions of the costs are 37½, 37½, and 25 per cent. respectively. The cost to the farmer at present is 10s. per cow per lactation, or the value of 2½ lb. of butter. To this must be added the value of board and accommodation provided for the herd recorder. These costs are allowable taxation deductions. Payment is made by means of an order issued on the factory supplied by the farmer.

Question: How much longer does it take to milk the cows during the recording period?

Answer: The first time the herd is recorded it may take half an hour longer to milk the herd. However, once a routine is established the increase in the time of milking is negligible.

Question: What happens if a cow is sick, or gives an abnormal yield, at the time of recording?

Answer: If, during the recorder's visit, a cow is noticed to be sick, affected with mastitis, in season, or her yield appears to be abnormal, the herd recorder notes this on the monthly record sheet. If necessary, a production is given for the month by averaging the productions of the preceding and succeeding months. A similar procedure is adopted when the herd has missed for a month.

Question: Is it worthwhile recording a herd which is not fed on concentrates?

Answer: Yes. Even on a low standard of nutrition recording will allow the ranking of cows for culling, and breeding purposes. Experiments have shown that the cows which are the highest producers under a low standard of feeding will also be the highest producers if the standard of feeding is increased.

Question: Is it easy for a farmer to use the information supplied by herd recording?

Answer: Yes. The information is presented in a simple form. Dairy officers and cattle husbandry advisers visit recording farmers regularly and discuss the use he is making of the information.

Protect Combs From Wax Moths

Both the larger and lesser wax moths have been damaging beecombs in Queensland apiaries.

In warm weather, wax moth infestation develops rapidly and can result in heavy destruction of beecombs. Combs are a valuable asset and well worth protecting.

The moths are active in weak colonies and on beecombs in storage.

Fumigation is the surest method of protecting the combs, and paradichlorobenzene or PDB is the fumigant most commonly used.

To fumigate, stack the combs five supers high and seal any open cracks with gummed paper. PDB, which is non inflammable and therefore safe to handle, can be used at the rate of 3 oz. per stack. As this fumigant will not destroy wax moth eggs, re-fumigation is necessary about every two to three weeks in the summer to destroy subsequent populations.

—*C. ROFF, Adviser in Apiculture.*

bucket and bail

Tinning Inside Milking Machines.—An Agriculture Department survey on the life of the tinning inside milking machine pipes has brought some surprising results. It was popularly believed that this tinning had only a short life, but the survey has shown that it's sometimes retained for many years.

Of 41 machines four years old, 36 were still well tinned, four had lost some tin and only one had been completely de-tinned. Of 536 machines more than 10 years old, 27 per cent. were still well tinned.

The survey is being continued to determine the factors that influence the life of the tinning. It s hoped that definite recommendations on ways to protect this layer of tin will soon be available. Main value of the tinning lies in preventing the milk from picking up traces of copper from the pipes.

Milking Machine Test.—Reports are being received that some dairymen are refusing to have their milking machines tested for mechanical efficiency. Perhaps a few thoughts on the subject may be in order. Remember these points.

There is no charge for the test. The equipment was provided from Q.D.O. funds, and the dairy officers have been specially trained in its use. There is no compulsion about the officer's recommendations. Any minor faults are corrected on the spot, and if major repairs cannot be financed right away, at least provision can be made for them.

Do you know if the vacuum gauge is still correct? Or if the pulsators are still at the best adjustment? The board holding the milk lines may have shrunk and gradually moved the pulsators out of adjustment. Faults develop so slowly that they pass unnoticed.

A faulty machine can milk slower, leave milk behind, and predispose the udder to disease.

Have your machines tested when the dairy officer calls.

—J. D. ELRINGTON,
Senior Adviser in Dairy Machinery.

Keep Sediment Out of Milk.—Keep dust and cow-hairs out of milk and you'll also keep out many of the bacteria that spoil its keeping quality.

Quality-destroying bacteria are carried on foreign material that gets into milk, and even though most of the sediment can be strained out, the bacteria will remain.

The amount of sediment that gets into milk can be reduced by rinsing the dairy utensils, milking machines, the vat and the cooler with clean, chlorinated water before milking. This will flush away any dust and destroy the bacteria. Wash the cows' udders with a chlorine solution, and replace the rinsing water after use on 15 to 20 cows or sooner if it has become soiled. A stock-free area adjacent to the milk room and daily removal of manure from the yards and milking shed will keep down the dust nuisance.

—R. I. HUNTER, Dairy Officer.

Try Bails For Calf Feeding.—Use of calf feeding bails can save dairy farmers time and inconvenience over the years. As well as that, individual attention counts in calf rearing. Well fed and cared for calves are healthier, grow faster and come into production earlier than those given the minimum of attention.

Young calves have to be fed twice a day and in all weathers. So, any system that, at a reasonable cost, saves time and increases your working comfort is worthwhile. When you're building a new milking shed or altering an existing one, give some thought to including convenient calf feeding bails in your layout.

The three main features of a suitable layout are:

1. A concrete floor on which both the person feeding the calves and the calves can stand.

2. Individual sword-type bails to hold the calves.

3. A roof to give protection from the weather, but high enough to allow the sunlight to enter.

There are many advantages in having sword-type bails. Each calf is held securely, and one calf cannot reach into its mate's bucket. In this way you can be sure that each calf gets its proper ration and the slow drinkers are not bullied by those that finish quickly. In sword-type bails, calves can be safely left to drink or eat without attention.

Sometimes calves are slow in learning to take grain or meal mixtures. An easy method of teaching them can be employed in this type of bail. This consists of placing a little meal in the bottom of the bucket immediately after feeding with milk. In most cases calves will soon lick up the meal.

With individual bails, you can release some calves and detain others if you need to. Routine operations such as tattooing, vaccinating and drenching can be done easily by one man when the calves are held in sword bails.

For details of construction, consult your local Adviser in Cattle Husbandry.

—W. F. MAWSON,
Senior Adviser in Cattle Husbandry.

Is Your Wool Shed Gloomy?

Recently an inquiry came to the Department of Agriculture and Stock from an overseas country for typical photographs of Australian shearing scenes. These were to be used in a publication with a world wide coverage. On looking through all the shearing shed photographs, a thing that struck us very forcibly was how gloomy and ill-lighted is the average shearing shed.

Dim and gloomy woolsheds cannot do otherwise than make the work of the shearer and the woolclasser more difficult. Cut sheep, second fleece cuts, and incorrect classing of fleeces can no doubt often be fairly attributed to lack of adequate lighting, rather than to want of care in workmanship.

Certainly glare is not desired, but good indirect lighting can often be improved by better placing of skylights and windows, and by the white-washing of interiors near to the shearing board and classing tables.

Is your woolshed a bright cheery place with good visibility, or is it the sort of place that might towards the end of a busy day make a tired woolclasser feel that it was rather like the Black Hole of Calcutta?

—R. B. YOUNG, Senior
Adviser in Sheep and Wool.

Lights For Poultry

Lighting of poultry flocks has now become standard practice on many Queensland farms. March is the month when lights are generally switched on, but this varies with the age of the fowls. Birds hatched up to 10 or 12 months ago are the ones selected for lighting on account of their tendency to moult from the beginning of March onwards. Lights prevent this and keep up production.

Lights are switched on at 4.30 a.m. for the last part of March, but don't forget to drop back to 4 a.m. in April, 3.30 a.m. in May, and 3 a.m. in June. After June, lighting is generally advanced ½ hour per month until it corresponds with the sunrise. Pullets which have not made sufficient growth shoud not be subjected to lighting.

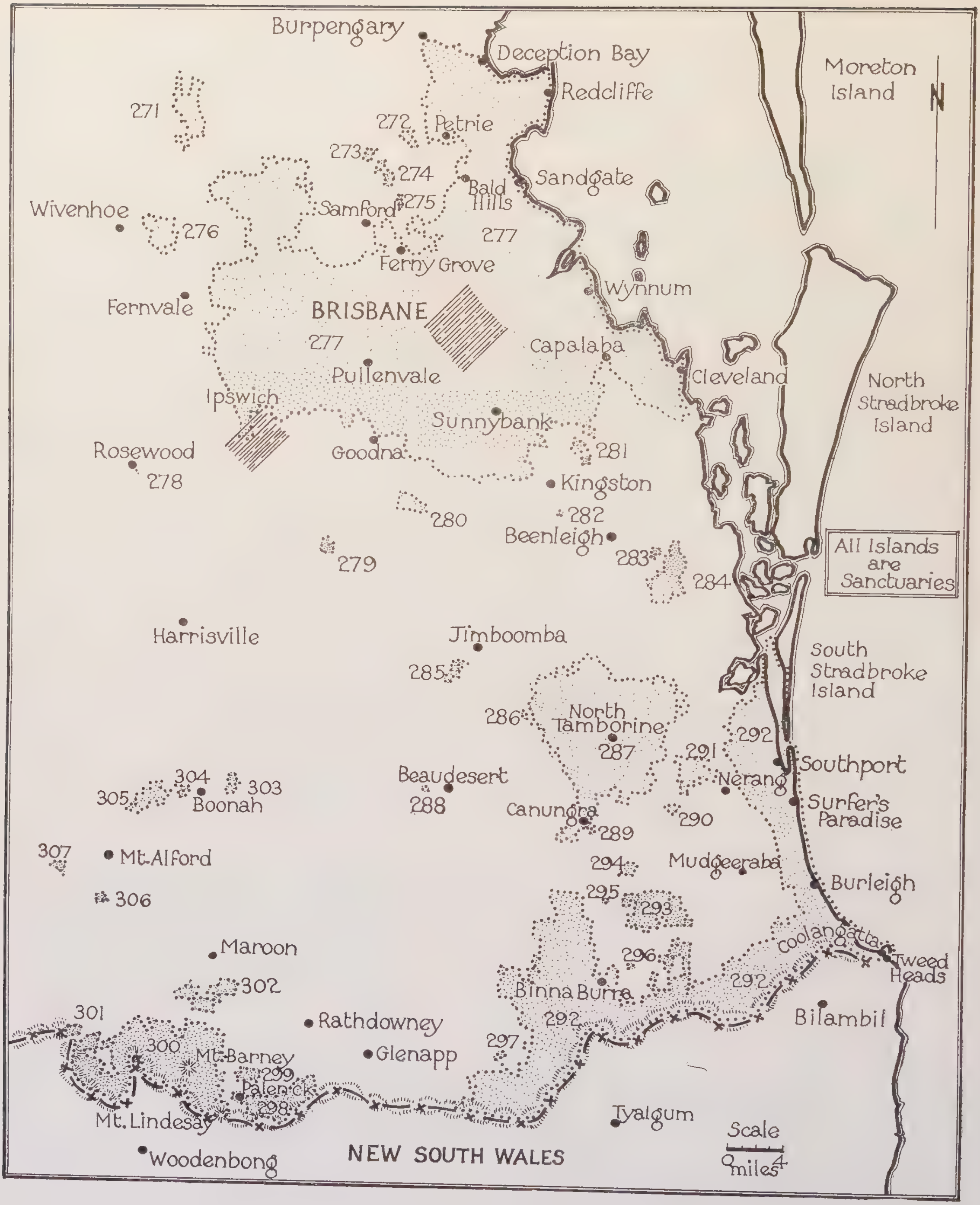
—C. MANNING, Senior
Adviser, Poultry Branch.

Queensland Fauna Sanctuaries

By C. ROFF, Fauna Officer

The following is an index of the sanctuaries outlined in Map 22.

Index No.	Sanctuary	Area in Acres
271	State Forest Reserve 808, parishes of Dundas and St. John, via Dundas	4,210
272	Property at Lawnton	284
273	State Forest Reserve 1662, parish of Samsonvale, via Clear Mountain	524
274	State Forest Reserve 1663, parish of Warner, via Clear Mountain	786
275	Property at Bunya	211
276	Properties at Fernvale	2,720
277	City of Brisbane Town of Redcliffe No. 5 Division, Old Moreton Shire Portion of Shire of Pine Old Shire of Cleveland Scenic Reserve and Properties in Deception Bay Properties at Petrie Property and Reserves, Nos. 120 and 125, North Pine The Summit and head of Cedar Creek and its tributaries Properties at Mount Glorious Properties at Closeburn Abattoirs Reserve, Wacol Recreation Reserve 359, Goodna (The area includes a number of State Forests and National Park Reserves)	423,680
278	School Reserve 246, Rosewood	12
279	Daley's Lagoon, Ripley	410
280	State Forest Reserve 446, parish of Stapylton, via Goodna	1,365
281	State Forest Reserve 215, parish of Redland, Daisy Hill	1,050
282	Water Reserve, Waterford	45
283	A Reserve in the Stapylton area	321
284	A Sanctuary in the Stapylton–Norwell area	3,926
285	A Reserve and Properties in the Cedar Grove area	892
286	"Mundoolum," via Beaudesert	196
287	Parishes of Cedar and Tamborine, Tamborine	55,680
288	Racecourse and Showground Reserve, Beaudesert	100
289	State Forest Reserve 729, parish of Witheren, via Witheren	77
290	State Forest Reserve 740, parish of Nerang, via Nerang	276
291	State Forest Reserve 571, parishes of Barrow and Nerang, via Nerang	4,277
292	South Coastal District Sanctuary "The Gorge," at Springbrook Upper Numinbah and Springbrook Sanctuary Upper Valleys of Coomera and Canungra Creeks and Cainbable Mountain Binna Burra Property at Kerry (The area includes a number of National Park Reserves and State Forest Reserves)	133,120
293	State Forest Reserve 702, parish of Numinbah, via Numinbah	4,557
294	"Tarlington," Beechmont	640
295	Reserve for Scenic Purposes, Beechmont	27
296	Property at Springbrook	160
297	"Moolabanya," National Park Reserve 617, parish of Telemon, via Lamington	224
298	State Forest Reserve 359, parish of Palen, via Palen Creek	1,440
299	State Forest Reserve 745, parish of Palen, via Palen Creek	883
300	"Mount Lindesay," "Mount Barney," National Park Reserves 737 and 738, State Forest Reserves 735 and 736, parishes of Melcombe and Palen, via Rathdowney	29,260
301	State Forest Reserve 786, parish of Alford, via Boonah	350
302	"Mount Maroon," "Mount May," National Park Reserves 322 and 760, parishes of Melcombe and Palen, via Maroon	3,630
303	Land near the Teviot Brook, Allandale	526
304	Land near Boonah and Dugandan	448
305	Land near Mount French, via Boonah	2,234
306	"Mount Moon," National Park Reserve 785, parish of Alford, via Mount Alford	295
307	"Mount Greville," National Park Reserve 755, parish of Clumber, via Moogerah	320


Burpengary
Deception Bay
Redcliffe
Moreton Island
N
271
272
Petrie
273
274
Bald Hills
Sandgate
Samford
275
Wivenhoe
276
277
Ferny Grove
Wynnum
Fernvale
BRISBANE
277
Capalaba
Cleveland
North Stradbroke Island
Pullenvale
Ipswich
Sunnybank
Rosewood
Goodna
281
278
Kingston
280
282
Beenleigh
All Islands are Sanctuaries
283
279
284
Harrisville
Jimboomba
South Stradbroke Island
285
286
North Tamborine
292
287
291
Southport
304
303
Beaudesert
Nerang
305
Boonah
288
Canungra
Surfer's Paradise
290
289
307
Mt. Alford
294
Mudgeeraba
Burleigh
295
306
293
Maroon
Coolangatta
Tweed Heads
296
302
292
Binna Burra
Bilambil
301
Rathdowney
292
297
300
Mt. Barney
Glenapp
299
Palen ck
298
Mt. Lindesay
Tyalgum
Scale
Woodenbong
NEW SOUTH WALES
0 miles 4

Map 22

Map Showing Sanctuaries in Part of Fauna District No. 1. The sanctuary boundaries (as at 31st December, 1957) are delineated by dotted lines enclosing the stippled areas.

Plate 10

Black Swan (Cygnus atratus **Latham) nesting on Brighton Lagoon, Part of the Greater Brisbane Area Fauna Sanctuary.**

* * *

Long Duck Flights

A grey teal banded on the Rifle Creek Dam sanctuary, Mt. Isa, two years ago was taken near Perth in Western Australia recently and the band was returned to the Queensland Department of Agriculture and Stock. This is the first time that a Queensland band has been received from Western Australia.

Bands have also been returned from Pillaga and Leeton (New South Wales) taken from black duck and plumed tree duck tagged at Townsville.

This work is part of the long range programme for the assessment of Queensland's wildlife. The objective is to conserve beneficial species and to restrict the damage to agriculture caused by others. Specifically the bird-banding scheme is assisting in the study of the habits and migrations of wild duck in Queensland.

Illegal Shooting At Tinaroo Dam

Atherton Tableland residents have reported that illegal shooters are active along the banks of the Tinaroo Dam. The impounded waters are an attraction to wildlife, especially waterfowl.

Tinaroo Dam is a fauna sanctuary and all hunting or trapping is prohibited. Fauna officers in the district are now keeping a close watch in order to stamp out illegal shooting on the dam.

Tinaroo Dam is an important unit in Queensland's sanctuary system. All residents and visitors are asked to co-operate in ensuring the conservation of fauna in the areas, and in all other sanctuary areas of the State.

—C. ROFF, Fauna Officer.

Producers Had A Mixed Year

By Officers of Marketing Branch

There were ups and downs in the earnings of Queensland primary producers in 1958-59. Prices of wool and sugar declined, and the market outlets for canned fruits were restricted by the heavier European crops and the liberalisation of dollar imports by the United Kingdom. Earnings from exports of meat and of dairy produce increased following both larger quantities and better prices.

Australian wool production in 1958-59 was estimated at 1,540 m. lb. greasy, an increase of 8 per cent. over the 1957-58 clip of 1,433 m. lb.

Sales of 705,657 bales in Queensland in 1957-58 increased to 725,198 bales in 1958-59, but the average price for greasy wool decreased to 50·37d. a lb. compared with 65·07d. a lb. in 1957-58. The lower average wool prices for this season were only partially offset by the increase in production.

Production of beef in Australia in 1958-59 is estimated at a record 875,000 tons, and exports at 175,000 tons. Production in Queensland in the 12 months ended June 30, 1959, was a record and 22 per cent. higher than in the previous year.

The 15-year meat agreement with the United Kingdom was last reviewed in September, 1958, when new minimum prices were negotiated. The new prices for beef and veal for 1961-64 are 9 per cent. less than the 1958-61 level, minimum prices for mutton for 1958-60 are the 1958-61 level less 15 per cent., and lamb prices for 1958-60 show a reduction of 5 per cent. on 1955-58. A welcome amendment is that the beef export free quota for the three years 1958-61 will be a maximum of 7,500 tons a year of first and second quality beef, with no quantitative restrictions on the export of lower grades.

This easing of exports of lower grades of beef resulted in the sudden large expansion of beef exports to the United States, encouraged by the upsurge in the United States demand for these lower grades which are suitable for the manufacturing trades. Beef exports to the United States trebled in 1957-58 to 6,134 tons, but in 1958-59 reached about 50,000 tons.

Another favourable influence on the beef export trade was the continued high prices in the United Kingdom. Owing in part to the decline of Argentine shipments they were on average about one-third higher than in the preceding year.

The increased demand for lower grade meat has affected cattle prices in Australia. Cull cows and bulls have brought prices better than those realised for first quality beasts 12 months ago. This should make possible younger and higher quality herds in both beef and dairy industries.

It appears that the home market will remain the major future outlet for Australian beef where over 80 per cent. of production is consumed, followed by the United Kingdom, where the 15-year meat agreement provides a guaranteed minimum price until 1967. The United States, at present, probably offers the best scope among other markets. However, livestock numbers in that country are building up rapidly and sooner or later demand will start to flatten out under the influence of heavier home marketing.

Dairy Products

With improved seasonal conditions, production of butter and cheese in Australia increased by 11 per cent. and 21 per cent. in 1958-59 to 192,059 tons and 41,872 tons respectively. The increase in butter was mainly in Queensland and New South Wales, whilst cheese production increased in all States. In Queensland butter production increased by 27 per cent. and cheese by 58 per cent.

During the year butter prices on the United Kingdom market improved from the low level of 205s. stg. a cwt. in May, 1958, to 343s. stg. in June, 1959. The price improvement fortunately came after increased shipments from Australia, but at a time when exports from European and New Zealand suppliers were lower than in the previous year, and when local United Kingdom production was also lower. The United Kingdom cheese market has been very firm since November, 1958, as a result of a shortage of local cheeses.

The future of overseas markets will continue to remain uncertain as long as heavy stocks, although somewhat less than last year, exist on the North American continent, and a high level of milk production in the United Kingdom is maintained in accordance with the agricultural policy of that country. In Australia, attention is being concentrated on attaining improved quality and technical efficiency, and on intensified sales promotion, and in 1958 the Federal Parliament passed the *Dairy Produce Research and Sales Promotion Act*, 1958, to provide the necessary finance.

Eggs

The economic position of the commercial poultry industry in Queensland improved in comparison with recent past seasons. The availability of feedstuffs improved and at prices estimated, on average, at about 20 per cent. below those of the previous season. Net average returns to suppliers to the Egg Marketing Board also increased from 43·36d. to 44·90d. a dozen. The quantity of eggs marketed by the egg marketing boards in Queensland increased by 10 per cent. over the previous season to 8·7m. dozen.

Despite cuts by the United Kingdom Government in the last two seasons, in the guaranteed prices for eggs, production there continues to expand. The subsidy earlier in 1959, during the flush season, amounted to about a third of their market value. For 1959-60 the guaranteed price will be reduced by another 1d. a dozen.

As a result of low prices in the United Kingdom a larger proportion of exports has been made to European continental outlets. The average net return to the Australian Egg Board—which marketed exports on behalf of all State egg marketing boards except New South Wales—was 2s. 11·004d. a dozen (Australian currency), slightly less than the figure of 2s. 11·391d. a dozen realised for the previous season.

As with the dairy industry the egg marketing organisation realises the uncertainty of overseas outlets for supplies surplus to local requirements. Efforts have been concentrated on improving handling efficiency, service, quality standards and package presentation, as a means of both holding down marketing costs and promoting local sales. Growers themselves have assisted by adopting changed husbandry practices, which have resulted in modification of the production pattern. This has resulted in higher production in the later summer and autumn months and a scaling down of the spring peak.

Sugar

A new International Sugar Agreement was negotiated at the United Nations Conference held in October, 1958, to replace the agreement which expired at the end of December. As previously, the agreement is for five years, but this latest agreement will cover a larger proportion of the international trade in sugar, as some important exporters, such as Peru and Brazil, have now joined.

The total export quota of the Commonwealth group of countries will remain at the existing level of 2·5 million tons for 1959, but will be raised to 2·75 million tons in 1960 and 1961. Australia's share will increase from almost 632,000 tons to approximately 650,000 tons.

The year 1958-59 was the first in which, because of market limitation, overproduction became a problem of some magnitude. It is estimated that a million tons of cane were left unharvested in Queensland, and a considerable tonnage was again unharvested from the 1959 crop. A record 1,412,000 tons of 94 net titre sugar were produced in Australia in 1958, about 147,000 tons in excess of the aggregate of peaks.

The average price for the 1958 season, for home consumption, surplus and excess sugar, was lower than for the previous year—£46 3s. 2d. a ton as compared with £49 5s. a ton. If Fourth quota sugar is included in the 1958 figures then the average price is reduced to £45 6s. 3d. Returns were influenced by the fall in export prices, which continue low, and at the end of June reached the lowest level for the post-war period. Export quotas under the International Sugar Agreement were reduced by the maximum provided for in the Agreement, but Commonwealth countries were not affected by this restriction.

At the annual talks under the Commonwealth Sugar Agreement the negotiated price for 1959 was fixed at £45 2s. stg. a ton, an increase of £1 5s. 4d. a ton on the 1958 price. As in previous years the agreement was extended for a further year, and now runs until the end of 1966. The quantity to be sold at the negotiated price was also increased by 2½ per cent., making the quantity in Australia's case 307,500 tons.

Good progress continues to be made with the installation of bulk-loading facilities; Lucinda, Bundaberg and Townsville were brought into operation by the end of 1959, and Mourilyan is scheduled for operation in 1960.

Fruit

Pineapple production from the 1958 winter crop was the highest on record for a winter crop, and this was followed by particularly heavy production from the summer crop. Out of the total summer crop, receivals by C.O.D. canneries of 39,619 tons, were an increase of 83 per cent. on the previous year and 37 per cent. on the previous record year, 1955. The continued increase in production in Queensland, together with continued severe competition on overseas markets, led to the present difficulties in the industry. The incidence of heavy crops and the smaller and slower sales of the processed pineapples has resulted in heavier demands on available finance, and to help the C.O.D. cannery tide over this period the Government has guaranteed a bank overdraft of £2·4 million.

The price for pineapples for May-June deliveries was reduced to £15 a ton, delivered Brisbane, for 1st grade, from £22 10s. a ton for the summer crop; third grade fruit was not accepted for canning.

Strawberry plantings in 1958 exceeded the record plantings of the previous year, and deliveries to factories through the C.O.D. increased from 515 tons to 595 tons. Production was such that restrictions had to be imposed by Northgate on receivals from non-subscribers. This factor, together with the lower prices paid in 1958, led to a considerable reduction in plantings.

Banana growers suffered in the year from overproduction with consequent lower returns. Traditional outlets in southern markets for Queensland fruit were lost, due to greatly increased production in northern New South Wales. Productivity in both States has increased considerably in recent years, but present prospects appear to discourage an expansion in acreage. Although bananas are an important tropical fruit in the Australian diet the demand appears to be satisfied, and this, together with the absence of export markets, is limiting expansion of the industry.

Grains

The year 1958-59 saw a complete change in the grain supply position in Queensland. In contrast to the poor crops and semi-drought conditions of the previous year, 1958-59 crops were heavy, and substantial surpluses of the major grain crops were available for export. Local market prices for feed grains were relatively low.

The wheat crop of 16m. bus., the third largest on record, was more than double the 1957-58 crop, and was more than adequate for domestic needs, providing a surplus of about 6m. bus. for export and carryover. Export sales of some 2·7m. bus., attracted an average premium over the Australian f.a.q. price of more than 10d. a bus. However, as expected, it is proving difficult to regain flour markets lost during the previous two years, when inadequate wheat supplies severely curtailed flour exports.

The International Wheat Agreement expired with the conclusion of the 1958-59 season, and a new agreement has been written to replace it. The United Kingdom has re-entered the agreement and the quantities traded under the new agreement should be much greater than the 295m. bus. provided for under the previous agreement.

The 1958-59 barley crop of 7·5m. bus. was nearly double the previous record crop, that of 1955-56; the 1957-58 crop had reached 3m. bus. With a plentiful supply of other feed grains—maize, grain sorghum and white french millet—only a relatively small quantity of barley was required for domestic purposes. The bulk was available for export, to which market sales were made to good advantage by The Barley Marketing Board and about 145,000 tons were exported.

Although overseas barley markets have been firm, large world supplies now appear to be assured or in sight for 1959-60, and the market is expected to be more difficult.

Marked improvements have been made in the handling of the crop, with the State Wheat Board handling intake on behalf of the Board.

The grain sorghum harvest yielded about 3·8m. bus., compared with 3m. bus. last year. With plentiful supplies of feed grains available, a large surplus existed for export and about 70,000 tons were sold overseas.

With an unsatisfactory overseas market for white french millet, large quantities of this grain were used locally for stock feed, with a weakenng effect on the local feed grain market. Similar conditions exist for the other birdseeds—canary seed and setaria (panicum). There has been a noticeable swing away from the growing of these crops, particularly from canary seed, to wheat and barley.

The acreage sown to linseed was small, followng poor yields in 1957-58, but plantings increased n 1959.

Tobacco Leaf

Between 1939 and 1959 Australian consumption of tobacco products increased from about 36m. lb. to approximately 50m. lb. But for the expansion of the local industry the whole of this increase would have had to be met by imports. The avings in overseas funds resulting from this increased production have been about £3m. per year, a substantial saving of foreign exchange.

During the last 10 years, Australian tobacco leaf production has risen from 3·4m. lb. to 14·8m. lb., and, although all tobacco growing States have contributed to the increase, Queensland alone has accounted for half this total. This State's production has increased from 1·6m. lb. in 1948-49 to about 7·2m. lb. in 1958-59.

This increase in domestic production has had a marked effect on the composition of tobacco products manufactured and consumed in Australia. The minimum percentages of Australian leaf which manufacturers are required to incorporate in their products, in order to qualify for reduced tariffs on imported tobacco, have been progressively increased. As from July 1, 1960, these percentages will be 28½ per cent. for cigarettes and 24½ per cent. for tobacco. Ten years ago the minimum percentages were only 3 per cent. for cigarettes and 5 per cent. for tobacco.

Cotton

A major development in the cotton industry during 1958 was the establishment of a demonstration and experimental plot, of 48 acres, in the St. George irrigation area, in which the Cotton Marketing Board co-operated with the Department of Agriculture.

Farmers in the St. George area are showing increasing interest in cotton growing. Results from earlier plantings were good, and the best yielding crop gave a very good yield, for a first essay at growing this crop, of 1,300 lb. of seed cotton an acre. In another new district—Texas-Inglewood—experimental plots yielded up to 2,200 lb. an acre.

Experimental plantings have been made in Victoria and New South Wales and the Board, which has the only cotton ginnery in Australia has made arrangements to gin the cotton on behalf of these growers.

In view of the increased amount of machine picked cotton which is resulting from expansion of the industry, the Board has under consideration the installation of improved machinery in the ginneries, with the object of ensuring the highest practicable outturn of high-grade cotton lint.

Peanuts

Growing and harvesting conditions were favourable for the 1958 crop, and receivals totalled over 18,000 tons, more than twice the crop of the previous year. The final payment was made to growers on the 1957 crop, bringing the average net return to growers to 12·385d. a lb., the highest return yet received.

Increased interest continues to be shown in peanut growing, and the acreage sown to the 1959 crop increased nearly 100 per cent. over the 1958 plantings, to an estimated 60,000 acres. The crop is a record one of about 34,000 tons.

The Board is thus faced with the problem of disposing of its largest crop on record, and it has taken steps to promote the increased consumption of peanuts in Australia. There appears to be a gradual increase in the consumption of peanuts, particularly of peanut oil.

What are the lessons?

The varying fortunes of the various commodities on the export market highlight our dependence on that market, and on organised marketing as such.

On the one hand we had the collapse of the export market for canned pineapple, the continuing decline in the wool market, the worsening of the export demand for eggs on our traditional markets, particularly the United Kingdom. On the other there was the improvement in the overseas market for dairy produce, and the spectacular, although possibly only temporary, increase in demand for lower grade meat from the United States.

These fluctuations emphasise, once again, the important role that organised marketing plays in stabilising returns to producers. By maintaining economic prices on the home market, and through the operation of equalisation schemes, marketing boards have ensured that returns to growers have been maintained at as high a level as possible.

Not only have marketing boards to expand sales on the local market, but they must have loyal support from all growers, if the benefits of organised marketing are to be taken full advantage of and shared equitably among growers, both large and small.

Farmer Brown Says:

"Good dairy hygiene is essential to protect milk and cream quality."

"Eliminate contamination; wash udder with sterilizer solution."

Queensland Beekeeping Legislation

By C. ROFF, Adviser in Apiculture.

Legislation on beekeeping in Queensland dates from 1931, when the first Apiaries Act was passed. Primarily it gave power to deal promptly and adequately with outbreaks of diseases of bees. A natural adjunct to this was a system of approval and registration of apiary sites so that inspections for disease would be facilitated. It was also required under the Act that any bees or beekeeping materials introduced into the State should be certified as free from disease.

These basic principles were maintained in *"The Apiaries Act of* 1938," and in addition, a certain degree of control of the industry was introduced to prevent overstocking of localities or encroachment between apiaries in south-eastern Queensland, where the greater proportion of the apiaries of the State were located.

The degree of protection against encroachment, under the Act of 1938, proved to be excessive, as relatively small apiaries could hold territory that was capable of carrying a greater number of hives and, consequently, of yielding a much larger crop of honey.

New apiaries could be established only at distances farther apart or farther from existing apiaries than is now considered necessary. There was also a tendency to limit the increasing number of migratory beekeepers from utilising potentially profitable areas. This was substantiated by instances where beekeepers, by mutual consent, as was allowed under the Act, positioned large apiaries at short distances without detrimental effects.

To correct shortcomings of the 1938 Act, *"The Apiaries Act of* 1947" was passed, coming into force on 31st March, 1948.

The Act is divided into parts, but for convenience it will be discussed under headings relating to requirements in declared districts, to the control of disease in the State as a whole, to the prevention of the introduction of disease and also to some general provisions.

REQUIREMENTS IN DECLARED DISTRICTS

The pastoral districts of Moreton, Darling Downs, Wide Bay and Burnett have been declared as Districts for the purposes of Part II. of the *Apiaries Act*.

Registration. Within this area of south-eastern Queensland a system of registration is provided which is somewhat different from that under the previous Act.

On 31st March in each year, every beekeeper, irrespective of the number of hives, must apply for registration and in doing so must supply certain information on a prescribed form regarding his apiary or apiaries. At a later date, he receives his certificate of registration for the period up to 31st March in the following year. No person is permitted to keep bees unless he is a registered beekeeper. No fees are charged under the Act.

Classification of Apiaries. Unless an inspector decides that a locality has become excessively stocked, no restrictions are imposed on the placing of apiaries consisting of less than 40 hives, and for convenience these apiaries are known as Apiaries Class A.

Apiaries Class B are those consisting of 40 hives or more. *The minimum distance between apiaries of this class is set down as half a mile.*

Plate 1

Beehives Loaded for Removal to a New Apiary Site.

An Apiary Class C is one consisting of at least 100 hives in which queen bees are bred for sale. A certificate indicating that an apiary is an Apiary Class C is issued only after the inspector has certified that the apiary is suitable for the purpose.

The benefit derived from this particular classification is that no other beekeeper is allowed to commence a new apiary within a radius of one mile of an Apiary Class C.

This restriction is provided to help the commercial queen-breeder to maintain the purity of his strain, but it may be noted that any apiary already established within the prescribed limits will not be affected. The holder of a certificate for an Apiary Class C may, however, give consent for any person to establish an apiary within the one-mile radius, subject always to Departmental approval.

Certain apiaries consisting of 40 hives or more may be clasisfied as Apiaries Class D. The site of such an apiary is intended to be available as a protected site in the event of the beekeeper desiring from time to time to leave it to follow a honey flow. Before a certificate will be issued, the beekeeper concerned must possess at least 150 hives, and in effect the site must be one that an inspector considers a suitable and convenient centre for that beekeeper's activities.

The owner of an Apiary Class D may remove any or all of his bees from that site to any other site without loss of rights, and in the period between this action and the re-occupancy of this site it is an offence for another beekeeper to establish an Apiary Class B within the half-mile radius.

However, in any certificate issued in connection with an Apiary Class D, conditions may be imposed to ensure that such a site is properly "worked" and that other beekeepers are not being unnecessarily restricted in that area. Certificates may be revoked at any time and the number of Apiaries Class D allotted to any beekeeper is determined by the Department.

A beekeeper having either an Apiary Class B or an Apiary Class D may give his written consent for any other beekeeper to establish an Apiary Class B or D at a distance of less than half a mile. If an inspector, after considering the local situation, is of the opinion that the establishment of a new Apiary Class B or D would not prejudice an already established Apiary Class B or D, then permission may be granted for the new apiary to be established and maintained for some determined period.

Sales and Removals. If a beekeeper sells, establishes or removes an apiary, he must advise the Department of his action within 14 days. Forms are available for this purpose.

Prohibited Sites. The keeping of bees on a site may be prohibited if any provision of the Act is being contravened or not complied with, or if the site has become unsuitable for beekeeping, or if the keeping of bees there is detrimental to public interest. Such a site then becomes known as a prohibited apiary site. If any person establishes or maintains an apiary upon such a prohibited apiary site he is guilty of an offence under the Act.

Registered Brands. It is necessary for each beekeeper to mark at least one hive in every 50 or part thereof with his registered brand number This brand number is supplied to each registered beekeeper on his certificate of registration. The marking must be in block letters and figures not less than two inches high and must always be maintained in a legible condition. The marking is to be placed on the front of the hive, and at least one of the hives marked shall be situated in the front row of hives.

CONTROL OF DISEASE

The part dealing with the control and restriction of diseases and pests affecting bees is by far the most important portion of the Act and it is in force throughout the whole State.

Frame Hives. Linked with inspectional work is the necessity to have good facilities for examining hives, and therefore beekeepers are required to keep their bees in frame hives maintained in good condition. A badly constructed or neglected frame hive makes effective examination for the presence of disease very difficult.

Disease Notification. In the event of a beekeeper noticing a disease in his apiary, he must notify the Department immediately; further, he must not sell or in any way dispose of any bees or materials while they are affected with or liable to spread disease.

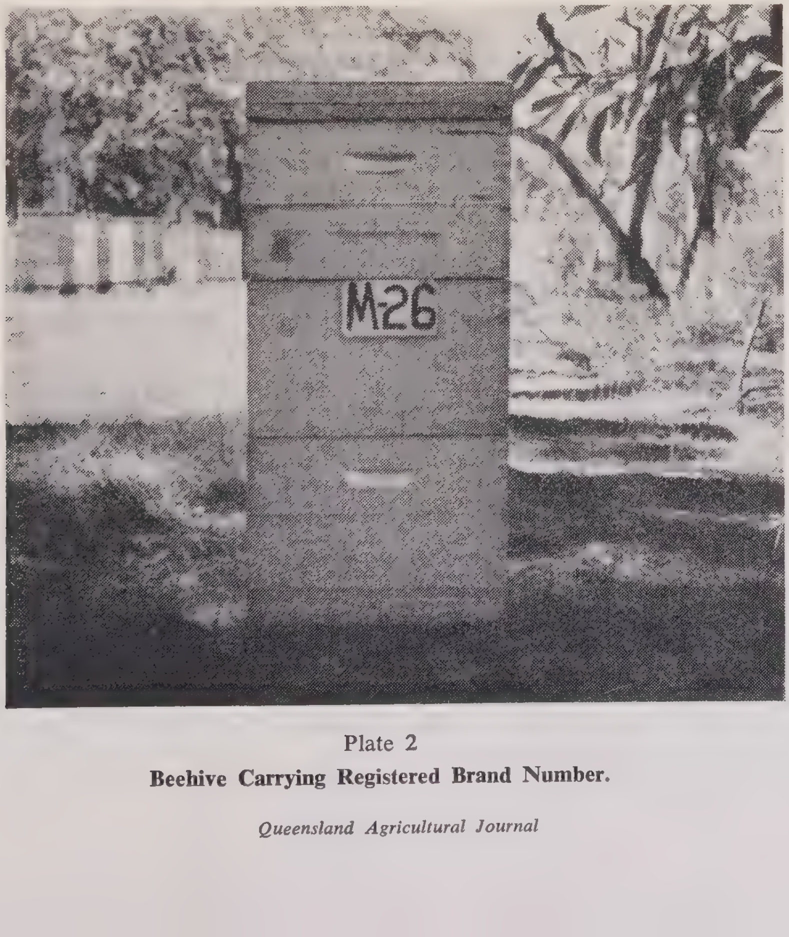


Plate 2

Beehive Carrying Registered Brand Number.

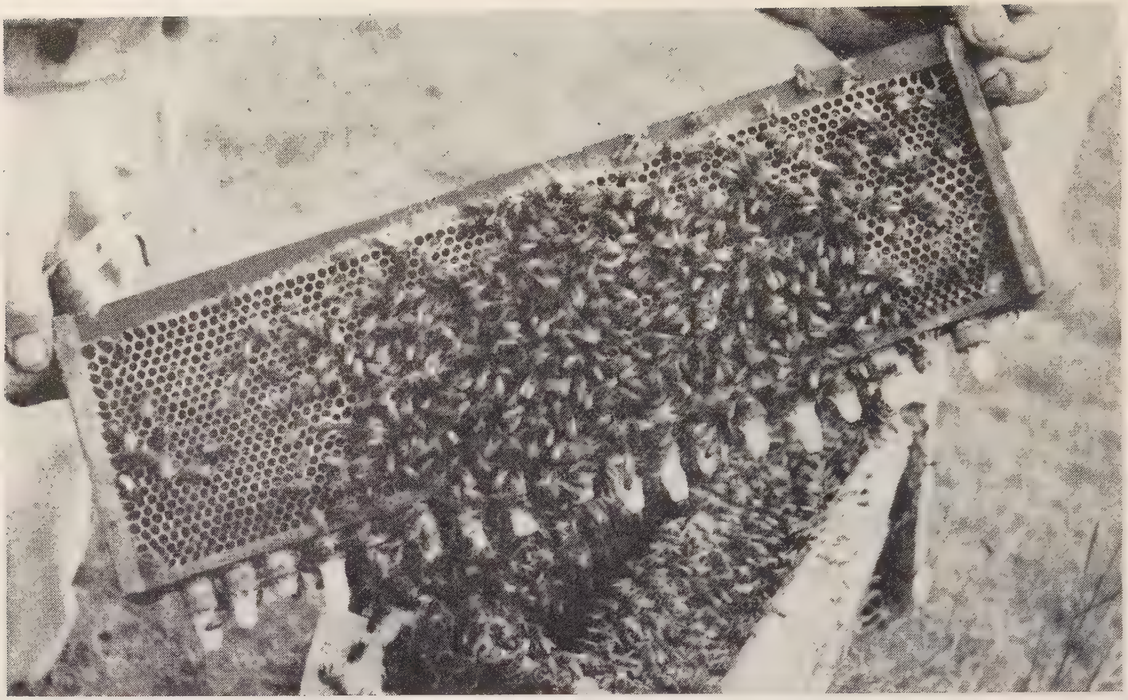


Plate 3

Well-Formed Queen Cells in a Queen-Rearing Apiary.

Destruction of Diseased Material. Under the Act power is given to the Minister to order the destruction of any diseased bees or disease-affected material. However, such action will follow only if an inspector has certified that in his opinion the diseased apiary is a source of danger to other bees and ought to be destroyed and the certificate is countersigned by the Director, Division of Plant Industry.

Quarantine. Particular areas or buildings may be declared quarantine areas for the purpose of disease control. Until a quarantine is lifted, no person is allowed to move bees or beekeeping material into, within or out of the area.

Disease Control Powers. In connection with disease control, samples may be taken by an inspector for investigation, vehicles stopped and inspected, consignments directed to a quarantine area for investigation, instructions given regarding methods of treatment to be carried out, and generally any other action may be taken or ordered that may be necessary to effect efficient control.

Queensland has been comparatively free from diseases in bees in the past and every endeavour must be made to keep it so in the future. The requirements relating to diseases were designed with this in mind, and normally they involve very little inconvenience to beekeepers.

PREVENTING INTRODUCTION OF DISEASE

Places of Entry. In coastal Queensland and along the southern border, certain towns are listed as places of entry. All bees, bee combs, beeswax, hives, honey and appliances coming into this State must come through one of these listed places. By "appliances" is meant gear or apparatus that has been used in beekeeping but it does not refer to new goods. The places of entry are Bowen, Brisbane, Bundaberg, Cairns, Clapham Junction, Coolangatta, Gladstone, Goondiwindi, Killarney, Mackay, Maryborough, Mungindi, Rathdowney, Rockhampton, Texas, Townsville, Wallangarra.

Restriction on Introductions. A consignment coming into Queensland must be accompanied by a declaration completed by the consignee and a certificate must be completed and signed by an approved officer in a Department in the State or country of origin corresponding to the Department of Agriculture and Stock in Queensland to the effect that the consignment comes from a disease-free district. A duplicate copy of this declaration and certificate shall, prior to the introduction, be forwarded to the Department of Agriculture and Stock, Brisbane.

Power to Quarantine. Upon arrival at a place of entry the consignment may be directed to a quarantine area for examination, and if found to be affected by disease, it may be detained in quarantine and treated in accordance with instructions.

Power to Return or Destroy. A consignment coming into this State without the necessary declaration and certificate shall be either returned to the sender or destroyed in quarantine.

Normally, any consignment coming to the State through a place of entry and accompanied by a properly completed certificate of freedom from disease will not be delayed.

GENERAL PROVISIONS

Beekeeper to Supply Information. A beekeeper may be required to furnish information regarding queen bees supplied by him or such statistics pertaining to beekeeping as an officer appointed under the Act may reasonably require of him.

Abandoned and Neglected Hives. In the event of an inspector being satisfied that any bees, hives or appliances have been abandoned and are neglected, he may take possession of them and dispose of them in a prescribed manner or in accordance with instructions from the Under Secretary. This provision may sometimes be very necessary, for an abandoned apiary can easily become a source of nuisance or danger to beekeepers in the locality.

Honorary Field Men. Honorary field men may be appointed and when required to do so may inquire and report on registration of beekeepers, location of apiaries, classification of apiaries, keeping of bees in frame hives, contraventions of the Act or such other matters as may be thought necessary by the Under Secretary. Honorary field men must be registered beekeepers and appointment will automatically lapse if beekeeping is relinquished by them.

SUMMARY

The main provisions of the Act may be briefly summarized as follows:—

(1) **Beekeepers throughout Queensland must keep their bees free from disease and in frame hives to permit effective examination.**

(2) **Beekeepers in the declared districts must register, provide descriptions of their apiaries, maintain a distance of at least half a mile between apiaries of 40 hives or more, and display their brand number on their hives.**

(3) **All introductions of bees, honey, &c., must be certified as having come from an area free from disease.**

Botany For Farmers

Although compiled in the first place for beekeepers, "The Honey Flora of South-Eastern Queensland" has a use for farmers and others interested in botany. It contains illustrations and descriptions of the important ironbarks, gums, bloodwoods, boxes, stringybarks, wattles, tea-trees, and cultivated plants such as lucerne, pumpkins, oranges and clover.

"The Honey Flora of South-Eastern Queensland" contains 199 pages and 178 illustrations. Prices are: In Queensland 15s. a copy, with a 3s. discount to registered apiarists, University botany students and booksellers; elsewhere £1 a copy.

Tuberculosis-Free Cattle Herds

(As at 1st February, 1960)

Aberdeen Angus

Crothers, G. H. & H. J., "Moorenbah", Dirranbandi
Elliott, A. G., "Ooraine", Dirranbandi
Mayne, W. H. C., "Gibraltar", Texas

A.I.S.

Cox, T. L. & L. M. J., Seafield Farm, Wallumbilla
Crookey, J., Arolla A.I.S. Stud, Fairview, Allora
Davis, W. D., "Wamba", Chinchilla
Dennis, L. R., Diamondvale A.I.S. Stud, Mundubbera
Edwards Bros., "Spring Valley" A.I.S. Stud, Kingaroy
Evans, E. G., Lauraven A.I.S. Stud, Maleny
Green, D. B., Deloraine A.I.S. Stud, Fairdale
Heading, C. A., "Wilga Plains", Maleny
Henry, Mrs. K., Greenmount
Henschell, W., "Yarranvale", Yarranlea
H. M. State Farm, Numinbah
Littleton, H. V., "Wongalea", Hillview, Crow's Nest
Marquardt, A. C. & C. R., "Cedar Valley", Wondai
Mears, G. S. & E., "Morden", M. S. 755 Toogoolawah
Moore, S. R., "Sunnyside", West Wooroolin
Neale, D. G., "Groveley", Greenmount
O'Sullivan, Con., "Navillus", Greenmount
Phillips, J. & Sons, "Sunny View", Benair, Kingaroy
Power, M. F., "Barfield", Kapaldo
Queensland Agricultural High School & College, Lawes
Radel, R. R. & Sons, "Happy Valley", Coalstoun Lakes
Roche, C. K., Freestone, Warwick
Sanderson, W. H., "Sunlit Farm," Mulgildie
Schloss, C. J., "Shady Glen", Rocky Ck., Yarraman
Scott, M. E. & E., "Wattlebrae" A.I.S. Stud, Kingaroy
Scott, W. & A. G., "Walena" A.I.S. Stud, Blackbutt
Shelton, R. A. & N. K., "Vuegon" A.I.S. Stud, Hivesville, Murgon
Sokoll, A. H., "Sunny Crest", Wondai
Sperling, G., "Kooravale", Kooralgin, Cooyar
Sullivan Bros., "Valera", Pittsworth
Sullivan, D., "Bantry", Pittsworth
Sullivan, F. B., "Fermanagh", Pittsworth
Thompson, W. H., "Alfavale", Nanango
Webster, A. H., "Millievale", Sabine, via Oakey
Wieland, A. W., "Milhaven", A.I.S. Stud, Milford, via Boonah

Ayrshire

Dudgeon, C. E. R., Marionville Ayrshire Stud, Landsborough
Dunn, T. F., "Alanbank", Gleneagle
Goddard, B., Inverell, Mt. Tyson, via Oakey
Holmes, L., "Benbecula", Yarranlea
Mathie, E. & Son, "Ainslie", Maleny
Scott, J. N., "Auchen Eden", Camp Mountain
Zerner, G. F. H., "Pineville", Pie Creek, Box 5, Post Office, Gympie

Friesian

Behrendorff, E. C., Inavale Friesian Stud, M.S. 786, Boonah
Macdonald, S. E. G., "Freshfields", Marburg
Naumann, C. H., "Yarrabine", Yarraman
Pender, D. J., Lytton Road, Lindum
Stumer, A. O., Brigalow, Boonah

Guernsey

Doss, W. H., Degilbo, via Biggenden
Fletcher, A. B., "Cossart Vale", Boonah
Holmes, C. D. (owner Holmes L. L.), "Springview", Yarraman
Johnson, G. L., "Old Cannindah", Monto
Miller, G., "Armagh Guernsey Stud", Armagh, M.S. 428, Grantham
Ruge, A. & Sons, "Woowoonga", via Biggenden
Sanderson, N. H., "Glen Valley", Monto
Scott, C., "Coralgrae", Din Din Rd., Nanango
Swendson, A. C., Coolabunia, Box 26, Kingaroy
Wissemann, R. J., "Robnea", Headington Hill, Clifton

Jersey

Beckingham, C., Trout's Rd., Everton Park
Birt, W. C. M., Pine Hill Jersey Stud, Gundiah
Borchert, Mrs. I. L. M., "Willowbank" Jersey Stud, Kingaroy
Burrows, R. N., Box 23, Wondai
Bygrave, P. J. L., The Craigan Farm, Aspley
Carpenter, J. W., Flagstone Ck., Helidon
Conochie, W. S. & Sons, "Brookland", Sherwood Rd., Sherwood
Crawford, R. J., Inverlaw, Kingaroy
Farm Home For Boys, Westbrook
Fowler, P. & Sons, "Northlea", Coalstoun Lakes
Harley, G., "Hopewell", M.S. 189, Kingaroy
H.M. State Farm, Palen Creek
Hutton, D. R., "Bellgrath", Cunningham, via Warwick
Johnson, H. G., Windsor Jersey Stud, Beaudesert
Lau, J. F., "Rosallen", Goombungee, Toowoomba
Matthews, E. A., "Yarradale", Yarraman
McCarthy, J. S., "Glen Erin", Greenmount, Toowoomba
Meier, L. E., "Ardath Stud", Boonah
Noone, A. M. & L. J., "Winbirra", Mt. Esk Pocket
Porter, F., Conondale
Q.A.H.S. & College, Lawes
Ralph, G. H., "Ryecome", Ravensbourne
Scott, Est. J. A., "Kiaora", Manumbar Rd., Nanango
Semgreen, A. L., "Tecoma", Coolabunia
Seymour, B. T., "Upwell" Jersey Stud, Mulgildie
Smith, J. A. & E. E., "Heatherlea" Jersey Stud, Chinchilla
Tatnell, W. T., Cedar Pocket, via Gympie
Toowoomba Mental Hospital, Willowburn
Verrall, F. W., "Coleburn", Walloon
Weldon Brothers, "Gleneden" Jersey Stud, Upper Yarraman

Poll Hereford

Anderson, J. H. & Sons, "Inverary", Yandilla
Hutton, D. R. & M. E., "Bellgrath", Cunningham, via Warwick
Maller, W., "Bore View", Pickanjinnie
Maller, W., "Bore View", Gowrie Junction
McCamley, E. W. G., "Eulogie Park", Dululu
Wilson & McDouall, Calliope Station, Calliope

Poll Shorthorn

Leonard, W. & Sons, Welltown, Goondiwindi

orchard and garden

Grow Local Papaws.—The papaw is touchy as to environment, and it is preferable to grow types with proved reputations in your own district than take risks with varieties or strains with high reputations elsewhere. The top-line papaw around Mackay or Yarwun might easily prove a disappointment when tried at Redlands, on the South Coast, or in other centres.

There are few standard papaw varieties, and experience has shown that the best way to start is with seed from high-quality trees on your own farm or in your own district.

Fairly uniform types have been developed in this way. Thus, we have the well-known Brookfield and Sunnybank strains, which are suited to these areas and extensively grown there. The bisexual Guinea Gold is a major strain at Yarwun, and the recently developed Hybrid No. 5, bred by this Department, appears best for our near North Coast. In the latter case, fresh seed from an accurate source must be used for each planting.

Selection is essential, of course. The parent trees should be vigorous, giving high yields and quality fruit which is well-shaped, colours nicely, and has firm thick flesh with good flavour. Seed selected from desirable tree types will produce fairly uniform strains. With a little extra trouble which entails hand-pollination of selected trees you can produce a pure type.

The process is not difficult and is described in the papaw leaflet available on inquiry from this Department.

—*D. DOWDLES, Horticultural Adviser.*

Irrigating Rockmelons.—Over-watering and too-frequent watering after the commencement of flowering can be harmful to the rockmelon crop. At this stage, the crop must not be allowed to remain wet for long periods.

Normal watering schedules provide for irrigation at 14 to 21-day intervals while the vines are growing; at 10 to 14-day intervals when the plants begin to flower and set fruit; and at seven to 10-day intervals when the fruit is filling and harvesting is in progress.

Irrigation of the maturing crop is complicated by the susceptibility of rockmelons to downy and powdery mildews. The crop has to be supplied with sufficient water, yet the plants must be kept as dry as possible. This is done by irrigating in the morning of a fine, clear day.

—*E. L. HASTIE, Adviser in Horticulture.*

* * *

New Book

Bananas. By N. W. SIMMONDS, M.A., A.I.C.T.A., F.L.S., Senior Cytogeneticist, Imperial College of Tropical Agriculture, Trinidad.

Brucellosis-Tested Swine Herds

(As at 1st February, 1960)

Berkshire

Clarke, E. J., Mt. Alford, via Boonah
Cochrane, S., "Stanroy", Felton
Cook, F. R. J., Middle Creek, Pomona
Crawley, R. A., Rockthorpe, Linthorpe
Edwards, C. E., "Spring Valley" Stud, Kingaroy
Farm Home For Boys, Westbrook
Fletcher, A. C., "Myola" Stud, Jimbour
French, A., "Wilson Park", Pittsworth
H. M. State Farm, Numinbah
H. M. State Farm, "Palen" Stud, Palen Creek
Handley, J. L., "Meadow Vale", Lockyer
James, I. M. (Mrs.), "Kenmore" Stud, Cambooya
Kimber, E. R., Block 11, Mundubbera
Law, D. T., "Rossvill" Stud, Aspley
Lees, J. C., "Bridge View" Stud, Yandina
Ludwig & Sons, A. R., "Beau View" Stud, Beaudesert
O'Brien & Hichey, J., "Kildurham" Stud, Jandowae East
Orange, L. P., "Hillview", Flagstone Creek
Pfrunder, P. L., Pozieres
Potter, A. J., "Woodlands", Inglewood
"Tayfield" Stud, Taylor
Q.A.H.S. & College, Lawes
Regional Experimental Station, Hermitage
Rosenberger, N., "Nevrose", Wyreema
Schellback, B. A., "Redvilla" Stud, Kingaroy
Smythe, E. F., "Grandmere" Stud, Manyung, Murgon
Stark, H. L., "Florida" Stud, Kalbar
Thomas & Sons, F., "Rosevale" Stud, Laravale
Traves, G., "Wynwood" Stud, Oakey
Weier, V. F., "La Crescent", Clifton
Wolski, A., "Carramana", Warra
Young (Jnr.), W., Kybong, via Gympie

Large White

Assenbruck, C., Mundubbera
Barron Bros., "Chiltern Hill", Cooyar
Bell & Son, E. J., "Dorne", Chinchilla
Butcher, Dr. B. J. & Parnwell, A. J., Plunkett, via Tamborine
Clark, L. D., Greens Creek, Gympie
Duncan, C. P., "Hillview", Flagstone Creek
Fowler, S., "Kenstan", Pittsworth
Franke, H. J., "Delvue" Stud, Cawdor
Garawin Stud Farm Pty. Ltd., 657 Sandgate Rd., Clayfield
Gibbons, A. E. H., Mt. Glorious
Gibson, H., "Thistleton" Stud, Maleny
H. M. State Farm, Numinbah
Hall, M., "Milena" Stud, D'Aguilar
Heading, J. A., "Highfields", Murgon
Horton, C. J., "Mannuem Brae" Stud, Mannuem, Kingaroy
Hutton, G., "Grajea" Stud, Cabarlah
Jensen, S., Rosevale, via Rosewood
Jones, K. B., "Cefn" Stud, Clifton
Kahler, J. & S., East Nanango
Kanowski, A., "Exton", Pechey
Kennard, R. B., "Collar" Stud, Warwick
Larsen, H. L., "Oakway" Stud, Kingaroy
Law, D. T., "Rossvill" Stud, Aspley
Lees, J. C., "Bridge View", Yandina
Lobegeiger, L. C., "Bremer Valley" Stud, Moorang, via Rosewood
Mack, A. J., Mundubbera
Palmer, A., "Remlap", Greenmount
Pampling, G., Watch Box Rd., Goomeri
Postle, R., "Yaralla" Stud, Pittsworth
Powell, R. S., "Kybong", Gympie
Q.A.H.S. & College, Lawes
Radel, V. V., Coalstoun Lakes
Regional Experimental Station, Biloela
Robinson, O. R. & O. J., "Linvale", Argoon, Biloela
Skyring, G. I., "Bellwood" Stud, via Goomeri
Stanton, H. R., "Tansey" Stud, via Goomeri
Stewart, L., Mulgowie, via Laidley
Stumer, K. F., French's Creek, Boonah
Wharton, C. A., "Central Burnett" Stud, Gayndah
Wieland, L. C. & E., Lower Cressbrook, Toogoolawah
Zahnow, W., Rosevale, via Rosewood

Tamworth

Armstrong, H. J., "Alhambra", Crownthorpe, Murgon
Booth, J. D., Swan Creek, Warwick
Campbell, P. V., "Lawnhill" Stud, Lamington
Coller, R. H., Tallegalla, via Rosewood
Fletcher, A. C., "Myola" Stud, Jimbour
Herbst, L., "Hillbanside", Bahr Scrub, Beenleigh
Kajewski, W., "Glenroy" Stud, Glencoe
Kanowski, S. E., "Miecho", Pinelands
Potter, N. R., "Actonvale" Stud, Wellcamp
Regional Experimental Station, Kairi
Salvation Army Training Home For Boys, "Canaan" Stud, Riverview
Skerman, D. F. L., "Waverley", Kaimkillenbun
Stephen, T., "Withcott" Stud, Helidon
Thomas & Sons, F., "Rosevale" Stud, Laravale
Wieland, L. C. & E., Lower Cressbrook, Toogoolawah

Wessex Saddleback

Ashwell, J., "Green Hill", Felton South
Cooper, G. J., Neumgua
Douglas, W., "Greylight" Stud, Goombungee
Dunlop, J. B., "Kunawyn", Acacia Rd., Kuraby
Kruger & Sons, "Greyhurst" Stud, Goombungee
Law, D. T., "Rossvill" Stud, Aspley
Mack, A. J., Mundubbera
Scott, A., Wanstead Stud, Grantham
Smith, C. R., "Belton Park", Nara
"Wattledale" Stud, 432 Beenleigh Rd., Sunnybank

Large Black

Pointon, E., Goomburra

Landrace

Grayson, D. G., Killarney
Neilsen, L. R., "Sunny Hill", Ascot, via Greenmount

For Country Cooks

Notes from the JUDITH MAY TEST KITCHEN, directed by RUBY BORROWDALE for the Butter Marketing Board

Here's a creamy, rich pie you'll want to serve often when guests join the family for dinner.

Luscious Fruit Pies

While apples and pineapples are almost sure o top the poll in any quest for a favourite fruit pie filling, the stone fruits give welcome variety to what must be recognised as the most popular dessert dish.

Plums, peaches, apricots and cherries make delicious pies and combinations of two or more of these fruits together with apples and pineapples can give delightful results.

One of the advantages of pie as dessert lies in its versatility. It can be served hot or cold and so is equally favoured to follow either a hot dinner or a summer salad.

Golden Dream Peach Pie

The Pastry.—I cup plain flour, ½ teaspoon salt, ¼ teaspoon ground nutmeg, 3 level tablespoons butter and 2 to 3 tablespoons milk. Sift flour, salt and nutmeg into bowl. Add the butter and cut it in until the particles are the size of small peas, Sprinkle the milk over the mixture, tossing lightly with a fork until dough is moist enough to hold together. Press into a ball. Roll out on floured board to an 11 in. circle. Fit pastry loosely into 9 in. pie pan. Fold edge to form standing rim; flute. Peel, cut into halves and remove stones from 5 to 6 ripe peaches then place, cut-side up, in uncooked pastry shell. Prepare the following topping—Mix together 1 cup brown sugar, 3 level tablespoons plain flour. Add 3 tablespoons butter and mix with fork until mixture is evenly blended and crumbly. Sprinkle over peaches. Bake in hot oven, uncovered (425 deg. F.) for 10 minutes. Then cover with another pie plate or aluminium foil and continue cooking in a moderate oven (375 deg. F.) for 35 to 40 min. Cool thoroughly before serving with vanilla-flavoured whipped cream. Place the whipped cream around the edge of the pie and sprinkle lightly with nutmeg.

Ever-Sure Pie Pastry

A short, tender pastry to make a reputation for a beginner. Use it for deep or shallow pies or tarts.

Two and a-half cups (lightly filled), plain flour, 1 teaspoon baking powder, ½ teaspoon salt, ¾ cup (6 oz.) butter, and about ¼ cup milk. Mix and sift the flour, baking powder and salt into bowl. Blend one-third cup of flour mixture to a smooth paste with the ¼ cup cold milk. Add the butter to the remaining flour mixture and cut it in until the pieces of butter are about the size of small peas. Drop flour-milk paste here and there over the dry flour and butter mixture; mix lightly with a fork until the paste will just hold together—do not overmix. Gather into a ball with fingers, wrap in waxed paper and chill for 1 hour in refrigerator. Roll to the thickness required. This is sufficient for a large two-crust pie or two tart shells.

Egg Yolk Pastry For Pies

Three-quarters cup (6 oz. butter), 2 cups plain flour, ½ teaspoon baking powder, ½ teaspoon salt, 1 egg yolk, 1 tablespoon sugar and about 5 tablespoons milk. Sift flour, baking powder and salt into bowl. Add the butter and chop it in very finely. Beat the egg yolk in a cup then stir in the sugar and milk. Add gradually to the flour-butter mixture, blending lightly with a knife until all flour is dampened. Press particles of dough together, knead lightly on floured board and roll to thickness required.

Cherry Chess Pie

Line a 9 in. pie plate with any of the pastries given. Flute or decorate edge. Pit 1 quart cherries after first washing them quickly in cold water, then draining well. Mix in 2 tablespoons plain flour, ½ teaspoon cinnamon, ½ cup sugar, 2 tablespoons honey, a pinch salt and 2 tablespoons melted butter. Stir in 3 well-beaten eggs. Pour this into the unbaked pastry-lined plate. Bake in hot oven (450 deg. F.) for about 15 min., to set the filling and the crust; reduce heat to moderate (350 deg. F.) and continue baking for 20 min. longer; or until filling is set. Cool but do not refrigerate and then serve with a whipped cream topping.

Custard Meringue Pie (Illustrated)

Line an 8 in. pie plate with any of the pastries given and decorate edge. Cover bottom of pastry with pitted cherries, sliced sweet plums or apricots, adding a sprinkling of sugar if necessary. Dot lightly with butter.

The Custard—½ pint milk, 1 tablespoon sugar, yolks 2 eggs, a pinch of nutmeg, cinnamon or ¼ teaspoon vanilla and 1 tablespoon butter. Warm milk and sugar and pour on to the well-beaten yolks of the eggs. Add the butter and flavouring and stir till butter is melted then pour over the fruit. Bake in moderate oven (325 deg. F.) about 45 min. or until lightly set. Remove from oven and prepare Meringue Topping: Place the whites of the 2 eggs in a basin and add a pinch of cream of tartar, pinch salt and few drops of vanilla essence; beat until soft peaks can be formed, then gradually beat in 4 tablespoons sugar. When very thick, spoon over pie. Return to slow-moderate oven (325 deg. F.) and bake about 15 min. or until meringue is lightly browned.

Two-Crust Fruit Pie

Line a 9 in. pie plate with pastry rolled to about ⅛ in. thickness. Roll out remaining pastry to cover top of pie.

The Fruit Filling—Prepare 4 cups fruit and place in basin. Chopped stoned apricots, peeled and chopped peaches, apples, pears or rhubarb cut into ½ in. lengths and mixed with a chopped apple, stoned cherries or washed and hulled strawberries. Mix together in a separate bowl ½ cup sugar and 2 level tablespoons plain flour, sprinkle this over the prepared fruit and mix well. This mixture should stand while preparing the pastry. Place this prepared fruit filling into the unbaked pastry-lined plate, piling it high in the centre. Dot generously with 2 tablespoons butter then cover with top crust. Press edges together and decorate top of pie if you wish. Brush pastry with milk and sprinkle with sugar. Bake in hot oven (450 deg. F.) then reduce heat to moderate and cook until fruit is tender, about 30 min. longer. Serve warm or cold. Serve warm with a custard sauce or cold with cream or ice cream.

Department Enters T.V.

Mrs. J. E. COWEN, of Yeerongpilly, waters bean seedlings while a Department of Agriculture and Stock camera records the scene as part of the film "Seeds That Grow," for use on T.V.

Turning Old Furniture Into New

Although it takes time and energy, you can do your own refinishing of furniture at home. Often an old piece of furniture looks shabby and dirty, but if you apply these methods of refinishing, you will turn it into a new piece that will delight your eye and enhance the beauty of your home:

Before buying second-hand furniture for refinishing, you will want to study it carefully. If it is worth refinishing it will have: (1) good work; (2) sound construction.

Supplies you'll need for removing the old finish are as follows:—

A good grade of commercial varnish remover.
An old can or dish for varnish remover.
A small paint brush.
A putty knife.
Steel wool.
Soft lintless rags.
Methylated spirit.
Old papers to cover floor.
Old gloves.

Removing Old Paint or Varnish

Varnish and paint remover is the best substance to use for removing old varnish. The directions on the container should be followed carefully.

Glass and commercial scrapers have a tendency to cut too deeply into the wood and take too much of the natural finish acquired by the wood. The natural finish or "patina" adds to the beauty and value of the furniture.

After old finish has been entirely removed, clean thoroughly with methylated spirits.

Preparing Wood for New Finish

You have now got down to the natural wood. And you may have had the pleasant experience of discovering that you have a truly fine piece of furniture. This is often the case with old family pieces that were sometimes painted over and used rather carelessly because sometimes our forebears did not appreciate their true value.

In any case, before applying the new finish, it will be worth your while to glue loose parts and raise dents.

Supplies you'll need are:—

Wood block for sanding—approximately 2½ in. by 4 in. and at least 1 in. thick.
Sandpaper—fine, medium.
Steel wool.
Plastic wood, or putty to use for filling small holes.
A good grade of furniture glue (casein glue).
Strips of strong cloth.
Clamps for holding glued parts in place.
Small strips of thin wood to use under clamps.

How to Glue Loose Joints and Parts

1. Scrape off all old glue from all parts to be glued.

2. If wood is too smooth, it may be necessary to cut in lightly with a knife.

3. Mix casein glue according to the directions on the container.

4. Apply glue to the surface to be glued.

5. Apply clamps or tie well with strips of strong cloth. Dampen cloth so binding will tighten as it dries, holding parts together more firmly.

6. Wait at least 24 hours before removing clamps. The pieces of wood will separate if they are not thoroughly dry.

To Raise Dents and Bruises

Apply a wet blotter or woollen cloth to the spot in the wood. Hold a hot iron near the wet blotter or cloth in order to produce steam. Several applications will help to raise the dent.

Important.—This treatment cannot be applied to veneered wood as it has a tendency to loosen the veneer.

To Fill Cracks and Holes

Cracks and holes may be filled in with putty. Stainer in oil is used to bring the putty to the desired matching colour. Plastic wood may be used but it is often difficult to stain the colour of the wood.

New Finish

Always sand with the grain of the wood. Scratches made by sanding across the grain are almost impossible to remove.

Begin with a medium grade sandpaper and gradually work up to a very fine grade.

Rub carved sections and turnings with steel wool.

Some fine grained woods are best finished by using steel wool instead of sandpaper.

Be careful to remove all dust from the furniture before continuing the finishing.

Natural Colour

The colour of wood may be determined by applying a warm priming mixture (⅓ linseed oil; ⅔ turpentine). Leave oil on only a few minutes and remove excess with soft cloth so that it does not become sticky.

Different Finishes

The beauty of the wood is determined by its natural grain and colour. We need to use every precaution in finishing in order to bring out these characteristics.

Stain is unnecessary unless the wood has no beauty—either of grain or colour.

Oil Finish

Raw or boiled linseed oil may be used. Boiled linseed oil penetrates more readily, but it needs to be rubbed immediately. Allowing it to stand on the wood more than about 15 minutes will cause it to dry and be sticky.

Raw linseed oil will not penetrate so readily, but may stand on the wood surface until the next day before it is rubbed. It will not become sticky.

First apply oil finish. Mix together ⅔ linseed oil; ⅓ turpentine. If the mixture is used hot, it will penetrate more quickly. Allow from 5 to 20 minutes for mixture to penetrate. Rub well with heavy grain sack or woollen cloth.

The surface may take from 6 to 12 applications of oil and turpentine.

For a harder finish, you may choose to use one of the following mixtures:—

For a varnish and oil mixture, rub in a mixture of 2 parts of ⅓ linseed oil and ⅔ turpentine and 1 part of clear waterproof varnish. (If a harder surface is desired, 2 parts of varnish may be used.)

This finish will not mar as does the ordinary varnish finish, and gives a soft sheen to the surface.

If the grain of the wood has been raised, it may be desirable to sand lightly with fine steel wool.

A final coat of wax will help to preserve this finish.

For a shellac and methylated spirit mixture rub in a mixture of ½ shellac and ½ methylated spirit. Apply with a soft, lintless cloth or brush. Wipe off excess before it becomes sticky. Shellac sets more quickly than varnish.

Sand lightly with fine steel wool after each application.

Wax for a final finish.

Penetrating Seal Finish

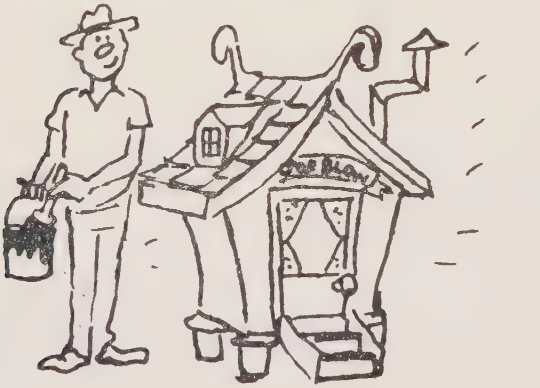
A penetrating seal finish could be used on furniture which gets hard wear. Purchase a good quality penetrating floor seal. Apply a coat to well-sanded furniture with a lint-free cloth. Allow to dry thoroughly—allowing at least the time listed in the directions on the tin. Sand lightly with steel wool. Remove dust with a soft cloth. The piece of furniture will need at least three coats with a light sanding between each coat. Use a final coat of wax and polish well. When the furniture becomes dull, remove wax and add another coat of seal using the same brand if possible. Wax with spirit wax and buff thoroughly.

Varnish or Shellac Finishes

Varnish or shellac finishes show mars and scratches, require more care and upkeep and occasional refinishing. If staining is necessary, apply an oil base stain before applying varnish. Oil base stain needs to be brushed in with the grain, then wiped with a cloth to remove excess stain. Allow to dry thoroughly. With a good brush, flow on a thin even coat of varnish or shellac brushing in one direction only. Sand lightly with steel wool or fine sandpaper and apply a second coat.

Prepare a thick paste of pumice and linseed oil. Apply with a cloth dipped in this mixture. Rub lightly with the grain until the high gloss and brush marks are removed. Rub with a woollen cloth to remove excess oil. Finish with a wax coat.

Farmer Brown Says:



"Good roadside shelters protect dairy produce."

"For weevil control, harvest maize as soon as it matures."

Watch Out For Wrong Electrical Connections

Electrical connections, improperly effected, can make booby traps out of ordinary household appliances. In the flexible cord which connects any electrical appliance with the power point, there are three wires. One, the earthing conductor, is coloured green. If this is connected to the wrong terminal of the plug or appliance, instead of to the earthing terminal, an electrical accident threatens.

Because of the improper connection the metal frame of the appliance becomes "alive" as soon as the current is switched on, and, under certain conditions, anyone handling the appliance would get an electric shock. To guard against this, regulations provide for safety by insisting that the earthing conductor of flexible cords is coloured a distinctive green for easy identification. Earthing terminals of plugs are also distinctly marked with the word "earth" or the letter "E".

The safe connection is, therefore, GREEN to EARTH. But the best way of making sure of safety is to have all such connections examined regularly by a certificated electrician. Alternatively, portable equipment and leads may be taken along to the office or depot of the local electricity supply authority, where they will be checked free of charge.

—*State Electricity Commission.*

New Way Of Making Children's Clothes

WHEN Mrs. Woodrow Dorsey of Waco, Texas (U.S.A.), started making clothes for her small daughters she had no idea that she was on the way to becoming an inventor and starting a family business. A home economics teacher whose speciality was dressmaking, her original intention was only to dress her chlidren attractively and do it efficiently.

From the ingenuity that this American mother applied to solving that problem has grown a new approach to dressmaking for children. Marketed under the name of Kiddie Key, this system of creative sewing consists of a basic pattern that can be cut in any style, adjusted to a perfect fit and used time after time.

"Sometimes one pattern can be used for three years by merely lengthening the bodice," says Mrs. Dorsey, who has created as many as 100 different dress styles from one key pattern.

"I thought with three little girls to clothe, I'd have plently of use for a special pattern that could be used again and again by adapting it to the size and growth of the girls," she says in explaining he origin of her invention. "Like my mother used to do, I cut my first patterns from old newspapers and drew sketches on wrapping paper."

While she was developing her pattern, Mrs. Dorsey tried it out in a special adult class n which she taught creative sewing. She noticed hat the women, although mostly beginners, were ble to copy ideas from pictures and other dresses, s well as to make up their own designs.

Plate 1: Mrs. Woodrow Dorsey Puts the Finishing Touches on the Dress Worn by Little Jo Beth Jackson. Mrs. Jackson made the frock for her daughter from a basic Kiddie Key pattern which she will save, adjust to size as the child grows and adapt it to other styles. One pattern can be used for three years simply by adjusting the bodice, says Mrs. Dorsey.

To please her husband, Mrs. Dorsey wrote out her method and developed a series of patterns scaled to the chest measurements of girls from 1 to 9 years old. The chest measurement is the key to basic fit, according to Mrs. Dorsey, who points out that other parts of the dress can be changed to suit a child's dimensions. "Shoulder seams must be short enough so the armhole won't sag. Sleeves must fit the little arm or the chubby arm. Waistlines must fit snugly and full skirts must hang evenly and have nice deep hems," are among the directions the inventor gives for making a well-tailored garment.

Plate 2: These Little Girls Model Their Kiddie Key Dresses, All Made from a Basic Pattern Scaled to the Child's Chest Measurement.

Once Mrs. Dorsey was invited to New York City to meet representatives of a sewing machine company that wanted to market her product. She was delighted when nothing came of the proposition because it would have meant travelling about the country. "They thought too much of promotion and all that goes with it. I am just a country person and mother, and I intend to remain so," she says.

Recently she has been drafting a key pattern for her 12-year-old daughter Charlotte. It covers the 10–11–12 age group. "If I ever find time, I intend to add a pattern for this age group to those we already sell," she says. Like the current Kiddie Key patterns, it will feature adaptability in size and styling.

—*United States Information Service.*

Cooking Of Meats

You can do wonders with the cheaper cuts of meat by cooking them in ways which will make them tender and appetising, and meat cooking lessons should include more than just ways of cooking roasts, grills and brown stew. Stewing steak beaten with a meat hammer or the edge of a saucer and then braised slowly in the oven with vegetables and tomatoes, tomato puree or juice, or a little vinegar, provides a most delectable dish. .

Long, slow cooking is the secret of most successful meat cookery. Liver has the highest food value of all the meats, but it is often su badly cooked that it is not as popular as it shoul be. It needs long, slow cooking if done i the oven, but there is a quick and easy way o doing it in the frying pan which is not very wel known. Skin the liver, then cut it in very thi slices, almost paper thin, diagonally across th lobe. Dip these slices in seasoned flour o oatmeal, then fry for only a minute or two o each side in a little hot fat. Cooked by thi method it just cannot be tough and is muc more likely to be eaten than the bootleatheris thick slices of liver so often served.

Recipe Of The Month

Lemon Marmalade

1 lb. of thinly sliced lemon;
2 pints of water.

Prepare the lemons and place in a basin with the water, allow to soak for 24 hours (the skin and pith of lemons does not boil clear). At the end of the soaking period place in a pa and cook until the peel is soft. Measure th pulp and add an equal measure of sugar. Sti until all of the sugar is dissolved. Bring to th boil and boil rapidly until the jam will se Remove the scum and bottle into hot jars an seal at once.

Treasurer's job is important

By J. PARK, State Organiser,
Junior Farmers' Organisation.

In some respects the treasurer of a club, or any rganisation, is the most important office bearer. Ie is in a position of trust, calling for honesty, eliability and accuracy with figures. It is the reasurer's responsibility to receive and take harge of club funds, and to keep an accurate ccount of them. It is his duty to prepare financial tatements and reports, and to keep the members eliably informed of the true state of finances of he club. Annually, the treasurer will be called pon to prepare and present to the members a tatement of receipts and expenditures and a alance sheet for the year just passed. The reasurer should devise appropriate ways and neans of raising funds and be ready to suggest ow the funds might be spent in the best interests f the members. He should be a member of he executive, and as such he should do all he an to ensure that the club earns a reputation for onesty and trustworthiness

BOOKKEEPING

Methods.—The system of bookkeeping adopted y a club should be as simple and as effective as ossible. The system used in the Junior Farmers' rganisation does not require any specialised nowledge, and may be carried out by anyone who prepared to devote a little time and care to is duties, and who has the ability to add and ubtract accurately.

The books required are:

(i) Receipt Book—Any standard type will do, provided that it permits the keeping of duplicates;

(ii) Cheque Book; and

(iii) Bank Deposit Book—
Both of which are obtainable from your bank;

(iv) Cash Book—The cash book will show receipts on the left-hand side and payments on the right-hand side. Each page should have two money columns.

Procedure.—All moneys received by the club should be handed to the treasurer who must issue a receipt for each separate amount. A duplicate of each receipt will be retained. Duty stamps are required by law to be affixed to receipts as follows:—

Exceeding £5 and not exceeding £50—2d.
Exceeding £50 and not exceeding £100—3d.
For every £100 or fraction after the first £100—3d.

The duty stamp is cancelled by the treasurer after it is fixed to the receipt. To do this the date and the treasurer's initials are written across the stamp.

From the duplicates of receipts issued the "Receipts" side of the cash book is written up. *A reminder is once again given that receipts must be issued for all moneys received.* The amounts of money received are shown in the cash book. *All* money received is banked. Let us turn to the "Receipts" side of a cash book and follow the examples through.

On February 5, a membership fee of 5s. is received from W. Brown. He is issued with receipt No. 42. On February 6, a donation is received from the firm of S. Smith and Sons who are issued with receipt No. 43. On February 7, the gross proceeds from the annual dance are handed in by the member who was responsible for running the dance. This member is issued with receipt No. 44 (N.B.—These gross proceeds will include door takings, entry fees for monte carlos, raffles, and so on. No payments to the orchestra or other persons must be made from these takings.)

CASH BOOK

Receipts

Date	Particulars	Receipt No.	Amount			Banked		
			£	s.	d.	£	s.	d.
1960								
Feb. 5	Membership fee—W. Brown	042	0	5	0			
Feb. 6	Donation—S. Smith and Sons	043	2	2	0			
Feb. 7	Gross Proceeds—Annual Dance ..	044	15	4	6			
						17	11	6

On February 7, the treasurer banked the fund he had received. The amount banke £17 11s. 6d., is shown in the appropriate column The duplicate of the deposit slip or the entry i your deposit book is the treasurer's receipt fro the bank for the money deposited.

At the end of the financial year the "Banked column is ruled off and totalled up. This tot should agree with the total credits on your ban statement for that period. Do not forget t include the interest allowed by the bank in th cash book.

It is desirable that all but the very smalle amounts should be paid by cheque. (Petty cas should be kept to a minimum.) All cheque should be "crossed", that is, two parallel tran verse lines ruled across the centre of the chequ and the words "not negotiable" added. Th ensures that the owner of the cheque receives th money it represents. The treasurer who make out the cheque should make sure that the butt each cheque is completed.

[TO BE CONTINUED]

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Grain Sorghum Tops Off Bullocks In Dry Spring

By J. A. ONLEY, Cattle Husbandry Branch

The intensification and diversification of agricultural production creates new problems and also new opportunities. This article tells how one producer dealt with the problem of lack of regrowth in winter crop when he needed it for topping-off young bullocks. Home-produced grain sorghum was crushed and fed to bullocks when it became obvious that the existing crop would fatten no more cattle.

Mr Colin Clift, of Giligulgul, has a property comprising 4,200 acres of brigalow-belah with some vine scrub country, situated about 27 miles north of Miles. It is very well developed, with 1,300 acres of cultivation. The remainder is good grazing country. During 1959, 550 acres were shut up for winter grain crops and 220 acres for grain sorghum.

The property carried 1,900 sheep, a breeding herd of 150 cows, plus calves and yearlings and 220 two-to-three-year-old steers for fattening.

Rainfall

The average rainfall for the area is 28½ in. The year 1959 was very dry during the winter and early spring as the following table shows:

TABLE 1

Rainfall	Points per Month
January	404
February	698
March	179
April	..
May	146
June	..
July	89
August	..
September	35
October	317

Outline of Programme

Last year, Mr. Clift was fattening 220 head of 2–3 year old steers. These consisted of 70 head bred on the property and 150 bought cattle. From March until early in July grazing consisted of fodder sorghums and grain sorghum stubble, and then grazing oats was available to carry on the crop fattening programme.

During this period the cattle fattened well. One hundred and five head were sold for an average net return of £49 14s. 3d. per head.

By mid-August, due to the continuing dry season, the oats had cut out except for a very short pick, and all cattle in a marketable condition had been sold.

Mr. Clift had on hand 520 bags of grain sorghum. At that time this would have returned about £8 a ton net if sold as grain.

Encouraged by reports of the successful use of grain sorghum in cattle fattening trials, Mr. Clift considered that this grain could have a use in bridging the gap in feed supplies until good rains brought relief. He contacted the Cattle Husbandry Branch of the Department of Agriculture and Stock, and it was decided to feed the grain in the paddock. The idea was to make use of what grazing was available and keep expenditure at a minimum.

His alternatives to this at the time were either to sell his remaining steers at a lower rate or else turn them out where they would have lost much of the weight they had gained during the past months.

Feeding Troughs

Portable feeding troughs were constructed from materials on hand. These consisted of spare sheets of heavy flat iron $\frac{1}{16}$ in. thick, 4 ft. wide and 9 ft. long; second class hardwood 6 in. x 1 in. boards and iron posts.

One iron sheet was placed on the ground. Six iron posts, one at each end and one midway along each side, were driven in. The sides of the trough were 12 in. high and consisted of two 6 in. x 1 in. boards. These were fixed by the use of 2 in. x 2 in. x $\frac{1}{8}$ in. angle iron corners. The sides of the trough rested on the iron floor and were held in position by wiring to the iron posts. To prevent cattle walking in the troughs, a batten was attached to the posts 3 ft. 6 in. above ground level.

Troughs were placed in shady positions near watering points. They could be readily dismantled and carried to different positions as required. Although they were not of very firm construction, the damage done to them by rubbing and so on was negligible.

Method of Feeding

A small grinder driven by the farm lighting engine was used to grind the sorghum. Approximately 35 bags could be handled in one day.

The grain was put out every day, and cattle had free access to as much as they wanted. Only two animals showed symptoms of over-eating. These were taken out for a few days and later returned with no ill effects.

Under this system the average consumption of grain per head per day was 13·8 lb. Apart from standing dry grass of little value, the only feed available was a very limited green pick from the oats, which cut out altogether in September, and later a short shoot of fodder sorghum. Cattle under similar conditions, but without the grain supplement, were losing weight at this time.

As can be seen from the rainfall figures for the year, virtually no effective rain was received from the end of May until October. The 89 points received in July came in a number of light showers and was not a good crop rain. By the middle of August the oats were eaten well down, and regrowth was very slow. From the point of view of normal grazing it was finished, but, with the cattle getting a grain supplement, this paddock continued to provide a short green pick for another month.

The feeding of grain under these conditions greatly lengthened the productive life of the grazing crop. This is an important advantage as, when paddock-feeding grain, it is very necessary to have sufficient palatable roughage available in a comparatively small area. If the roughage is not palatable or only sparsely distributed, cattle will expend too much energy in looking for their roughage requirements. Under such conditions good liveweight gains could not be expected.

Cattle should be brought on to grain gradually, preferably using hay or silage until they become accustomed to the grain feeding. Afterwards, provided there is some roughage available and the grain supply is maintained, the risk involved in this type of feeding is apparently not so high as sometimes believed. Digestive and physiological disturbances could cause trouble if there were insufficient roughage available or if cattle gorged themselves when troughs were refilled after being empty for some time.

Liveweight Gain and Performance

During the grain feeding period a representative 40 head were weighed to measure actual liveweight performance. The results were:

Liveweight (lb.)	Liveweight (lb.)	Gain	Gain per Day (lb.)
19-8-59	2-10-59		
880	942	62	1.41

After 2-10-59 most of the tagged cattle had been sold. On appearance, the remainder continued to put on weight and by the end of the period almost all were in sale condition. The exceptions to this were a few rangy types and some dairy steers which were obviously poor "doers."

Plate 1. **The Last of the Turnoff.**

Plate 2. **Troughs Were Placed in Shady Spots in the Grazing Paddock.**

'late 3. **Feed Troughs Were Simple, Quickly Made and the Materials Can Be Used Again.**

This 115 head was the "tail" portion of a nob of 220, and contained a proportion of dairy ype steers. All the best "doers" had been sold y the time feeding commenced. Those not nished at the end of the feeding period were the eally poor types which do not fatten well under ny circumstances.

A liveweight gain of 1·41 lb. per day under ie circumstances is reasonable. Better results ould be expected if the quicker fattening types ere being fed.

During the feeding period, 67 head were sold as fats for an average net return of £51 6s. 7d. per head.

The Financial Side

With an average liveweight of about 900 lb. in August, these cattle would have brought around £40 per head if sold, giving a total return of £4,600 for the 115 head. By feeding and selling them as fats the net return was:

> 67 head sold returned £3,439.
>
> 48 head held at the end of October for later markets could be valued at £48 per head. This gives a total return of £5,743 for 115 head.

This is a gross profit of £1,143 or almost £10 a head. From this must be deducted the value of the grain, cost of grinding, labour and so on, as follows:—

	£	*s.*	*d.*
520 bags grain sorghum	333	0	0
Labour in grinding	45	0	0
Cost in running grinder	7	10	0
Total	385	10	0

Depreciation on the troughing material would be quite small as all the components are still equally usable.

With regard to the actual feeding out, no extra labour was employed, but more efficient use was made of labour available. Only a small amount of time was needed to drive to the troughs and empty out the feed.

The net return of extra income over expenditure allowing for sorghum used was therefore:

£1,142 less £385 10s. = £757 10s.

Even with a very generous allowance for depreciation on material used and any sundry labour costs the net profit is still well over £700 for the 10 weeks' feeding period.

Although the crop-grass and grain sections of the ration are complementary it is reasonable to assume that the grain contributed 70-80 per cent. of the diet. On this basis the grain returned about £500 (£1 per bag) more as stock-feed than it would have realised on the grain market at the time when the stock feeding commenced.

What Was The Finding?

A number of important and interesting points came to notice during this feeding period. The value of grain sorghum, which gives heavy yields of good stock feed, is emphasised.

A very attractive financial return was gained for grain used in this manner. This method of fodder conservation fits in very well on properties which can grow grain and also fatten cattle. It very effectively bridges the gap caused by temporary crop shortages.

By feeding grain sorghum to cattle in the paddock, the effective life of a grazing crop was lengthened considerably during a vital period when lack of rainfall was inhibiting growth.

Care should be taken in getting the cattle accustomed to grain feeding. Horses, particularly, should not be allowed access to the grain troughs.

Troughs need not be elaborate but for preference should be portable.

From the point of view of property management, the use of grain sorghum in this way permitted adherence to a fattening programme despite unfavourable weather conditions. This was done with very little labour or capital cost.

The important aspect is that the grain feeding made possible the turn-off of cattle on a rising market. About half of the difference of £10 a head between the value of the stock in August and their value in October is accounted for by an increase in the price of meat. Thus only about one half of the difference in gross values at the two points of time was due to an increased weight of meat.

Although some allowance has to be made for the fact that the best of the draft had been turned off prior to grain feeding it should be pointed out that the efficiency of utilisation of the grain sorghum was comparatively low. In this case, 13·8 lb. of grain were required to produce a gain of 1·41 lb. of liveweight. Thus nearly 10 lb. of grain were required for 1 lb. of liveweight gain. Under feedlot conditions and when using a ration of 2 parts grain to 1 part lucerne hay, 1 lb. of liveweight gain has been obtained from about 6 lb. grain and 3 lb. lucerne hay.

In Mr. Clift's project the feed which the steers were able to obtain by grazing probably contributed no net energy to the animals. In other words, the nutritional value of the grazing was cancelled by the extra expenditure of energy by the animal in collecting it. Nevertheless, under the circumstances, this material was needed to avoid digestive upsets.

Weed Taints in Dairy Produce

As we enter the winter months, the appearance of weeds in crops and pastures spells trouble for the Queensland dairy farmer. Each year large quantities of milk and cream become tainted with chemicals carried over into the udder from the feed consumed by cows.

To give you some idea of the serousness of these flavours, of the 31 per cent. of choice grade butter which was down graded for defects during the 1955-58 period 50 per cent. of this amount was because of weed flavours.

To tackle this problem successfully it is necessary firstly to know which weeds are the culprits. Some offenders are Bitter Cress, Pepper Cress, Slender Celery, Turnip Weed, Turkey Berry and Fishweed. Ask your local Agricultural Officer to assist you in identification if you are in doubt.

What can be done about this problem? Firstly, give some thought to segregating morning and evening creams when supplying them to the factory. Then seek advice on the suitability of the wide range of weedicides as many of the tainting weeds are susceptible to these sprays. Finally try to keep one area of the farm free of weeds and direct the herd to this area a few hours prior to milking.

While these steps may not completely eliminate the problem they will at least minimise its effect.

—*W. D. MITCHELL, Dairy Technologist.*

10 Points On Mulesing

By R. B. YOUNG, Senior Adviser in Sheep and Wool

Resistance by the sheep blowfly to some chlorinated hydrocarbon preparations has been verified in some Queensland sheep areas. This has focussed attention on the usefulness of the Mules operation as a basic measure when considered in relation to other methods of fly control.

The Mules operation has the advantage of being a method of prevention, in that it helps to remove the breeding ground of the blowfly. Insecticides do not remove the breeding ground; they kill the maggot, or fly and maggot, when it has been attracted to a favourable breeding ground.

Once performed on a sheep, the Mules operation forms a lifetime means of protection, whereas insecticides have only a protection value asting a few weeks.

The Mules operation remains, in spite of growing resistance of fly to some insecticides, a basic step in a co-ordinated plan for fly control.

Plate 1 shows the result of a well performed Mules operation of the type that is demonstrated o sheep owners by field officers of the Sheep and Wool Branch. You can see how the operator has been able to do an effective job by observing he following points:

(1) Making sure that the sheep to be operated on have been recently crutched, or are within a week or two of being off shears. In the case of crutched sheep the wool should be removed at crutching time well above the base of the tail. Shortness of wool is very important with Mulesing. With any longer than two weeks' growth, the wool proves a great hindrance, blunting the shears rapidly, and making a day's Mulesing an ordeal instead of a simple task. Overlong wool also causes delayed healing.

Some operators prefer to carry out the Mules operation immediately off shears, or following crutching. Others find that they are able to achieve more satisfactory Mulesing cuts on sheep that have had a few days opportunity to "fill out" following shearing. Immediate off-shears operation has the advantage of obviating a second muster. Alternatively, allowing a few days to lapse after shearing permits operation on well rounded buttocks instead of hollow dehydrated skin and muscle presentation which can result from a long period of yarding during shearing. It also allows shearing wounds to heal. Sheep are probably in better condition and heart to recover from Mulesing if spelled after shearing than if subjected to both shearing and Mulesing during one yarding period. To avoid long-wool blunting of shears perhaps a maximum of 10 days would be the longest period that should be allowed after shearing.

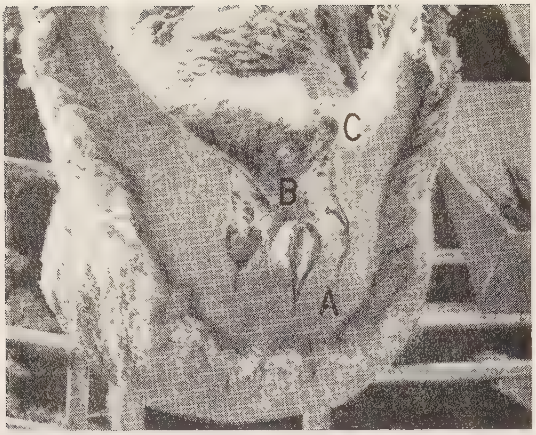


Plate 1

A Well Mulesed Sheep.

(2) By commencing the cut correctly without picking up the skin. It should start from a "V" at the point A (see Plate 1) at the side of the base of the tail. To achieve this start, a good method is to press down firmly with the thumb of the left hand on the right shear blade and the first two fingers of the left hand on the left shear blade with the shears slightly open at the tip, then make the first incision.

It is very essential, however, to avoid picking up the skin with the fingers until the first "V" incision has been made. If it is picked up with the fingers the result is likely to be a rounded pocket that will tend to encourage blowflies to enter to deposit eggs. If made without picking up the skin with the fingers the resultant "V" heals easily, and forms no inducement for blowflies seeking cover.

(3) Making sure that the greatest width of skin removed is opposite the vulva (marked B in Plate 1). Plenty of width here is desirable to ensure full stretch on healing. It is this stretch that determines the extent of bare area remaining when the wounds have completely healed.

(4) Ensuring that the cut has moved well in towards the vulva so that when the full cuts have been made on both sides they are only separated from one another by a distance of about two fingers' width in the region of the vulva.

(5) Finishing the cut in a narrowing inverted "V" at the point C, well down the leg from the vulva, and towards the inside of the thigh. The "V" cuts at start and finish assist rapid healing, and avoid pockets that could encourage fly strike.

(6) Making provision for the two areas of skin removed to leave neat symmetrical wounds of equal size. Without this evenness following stretching and healing, the vulva may be permanently distorted sideways, resulting in sideways emission of urine during micturition. This could soil wool and induce fly strike.

Plate 2

Ewe Weaner in Cradle, Recently Crutched, and Ready for Mulesing.

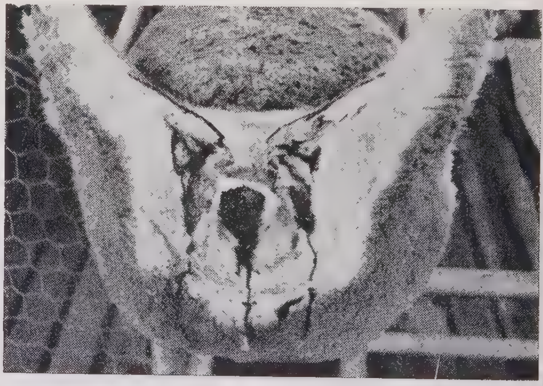


Plate 3

Immediately After Modified Mules Operation and Tail-Strip Cut.

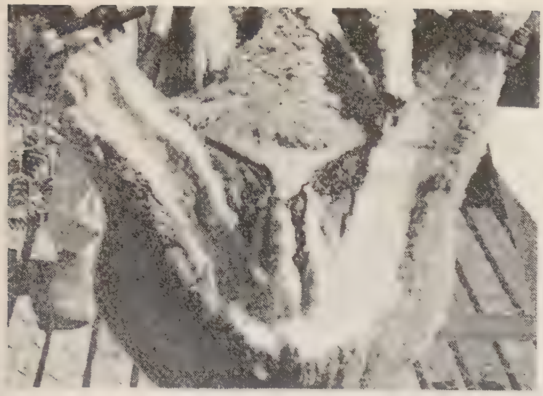


Plate 4
Taken Later in the Day of Operation.

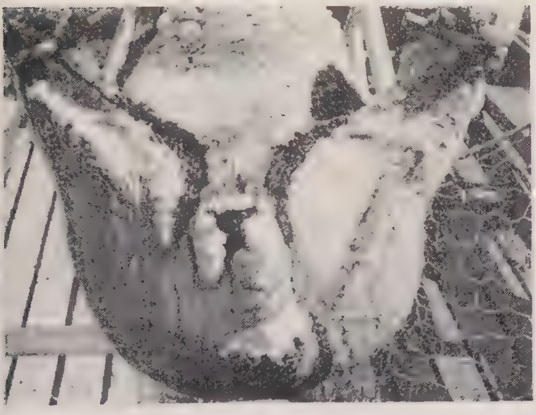


Plate 5
Taken One Day After the Operation.

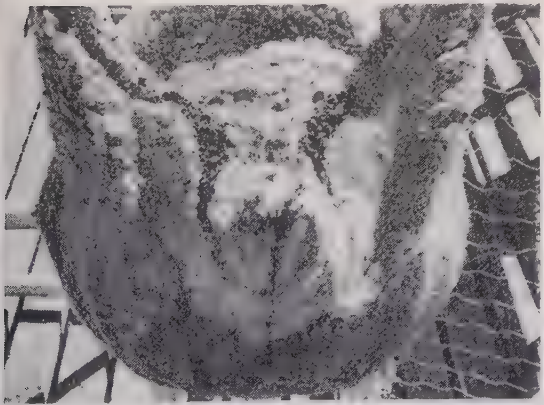


Plate 6
Taken One Week After the Operation.

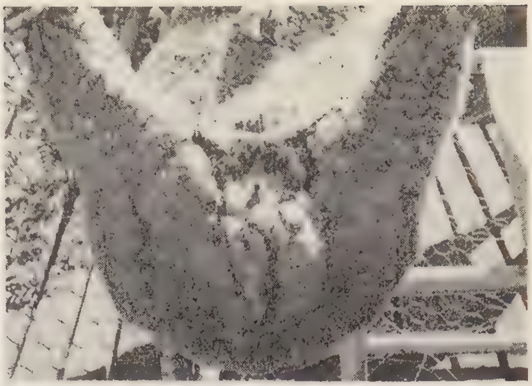


Plate 7
Taken a Fortnight After the Operation.

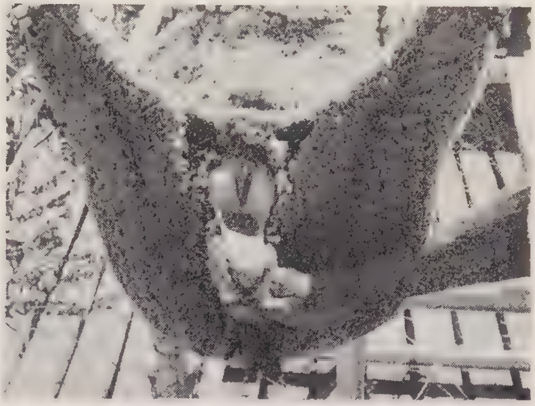


Plate 8
Taken Three Weeks After the Operation.
Note the spread of the bare area.

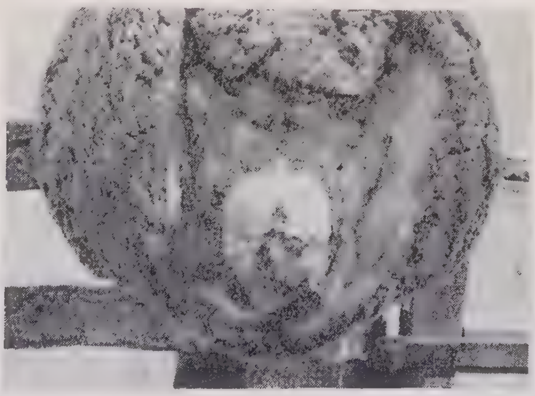


Plate 9
4-tooth Ewe, One Year After the Modified Mules Operation was Performed.

(7) Using sharp shears, as is apparent from the neat crescent cut formed by the gliding of the shears over the pin bone to completion at C in one smooth sliding movement. To achieve this the shears must be very sharp, and the blades kept well down on the sheep's rump during all parts of the cutting movement. Practice perfects this skill, and one may need to do hundreds of sheep before this craftsmanlike cut becomes second nature. But anybody can achieve it with sufficient practice and application.

(8) Taking care that the wounds are shallow, and do not go through the selvedge, so that there is little blood in evidence. This also results from using sharp shears and keeping the blades flat and tightly pressed against the sheep during all the sliding movement.

(9) Being careful that the tail cut is well carried out, starting from a "V" well up at the base of the tail, and expanding to the full width of the tail on completion. A follow through movement is required at the termination of the tail cut, to leave an even well-rounded finish at the end of the tail. Here also, as in the side cuts, the end result is quite symmetrical.

(10) Avoiding the common faults in Mulesing which are:

(*a*) Cutting into the bare area which surrounds the vulva.

(*b*) Cuts too wide apart, below the bare are

(*c*) Cuts uneven.

(*d*) Cuts not commencing and finishing sharpl with a point.

(*e*) Ragged edge cuts.

(*f*) Cuts not properly sited to achieve optimu stretching.

(*g*) Commencement of cuts not level.

By the use of the Mules operation, much nee less suffering of sheep from blowfly strike i avoided.

From a well-performed, evenly balanced Mule operation as shown in Plate 1, the extent stretch achieved on healing should give ver satisfactory fly control. Plates 4 to 9 show ho rapidly healing takes place following the Mule operation.

[*Acknowledgement for photographs is mad to Mr. G. LeGros, Adviser in Sheep and Woo Blackall, and for provision of sheep and faciliti for Mulesing to Mr. T. Hunter, "Evor Yalleroi.*]

* * *

Agricultural, Dairying, and Pastoral Statistics, 1959-60

Forms to be used for the annual collection of Agricultural, Dairying and Pastoral Statistics have now been distributed to primary producers throughout the State.

Great importance is attached to knowing the facts of the country's production at the earliest possible date after the close of the period to which the figures relate, and the achievement of this objective depends on producers promptly fulfilling their obligations.

Primary producers of all kinds (graziers, farmers, dairy farmers, orchardists, commercial flower-growers and nurserymen) who occup holdings of one acre or more, and *all* commerci poultry-farmers and commercial beekeepers a required to make returns. Any such produc who does not receive a form (A.P. 23) from th collector by the end of March should obtain o from the nearest Police Station and return promptly, duly filled in, to the police collecto

Individual returns are treated as strictly co fidential and are used only for the preparation statistical aggregates.

Plate 1 Harvesting Soybeans with an Autoheader

Growing Soybeans In Queensland

y **J. A. KERR,** Plant Breeder

he Queensland Department of Agriculture and Stock has been working for 25 years on the selection nd testing of soybeans in the South Burnett district. This article is a result of such work and contains advice for farmers on the growing of the crop in Queensland.

Soybeans could be a profitable crop in many arts of Queensland. The years of selection and esting leave no doubt that they are favoured by limatic conditions in the South Burnett and are uited to large areas of the soils.

They may be grown as a cash grain crop, or or green fodder, hay or green manure. While hey draw heavily on the soil for mineral utrients, they may gather nitrogen from the tmosphere and can accordingly become a valuble component in systems of crop rotation.

But what about markets?

That is the problem at present. The value of soybeans for human consumption, livestock rations and industrial purposes probably exceeds that of any other crop suited to Queensland conditions. The market in Australia has yet to be developed but the gradual increase in industrial utilization of soybeans warrants renewed and greater attention than the crop has received in the past. A few meals, pastes and sauces are produced at present. Sufficient soybean flour is produced to supply present bakers' requirements.

Lack of demand combines with competition from imported soybeans to retard development of Australian production. The generally higher quality of the local product has permitted the local industry to develop to its present level.

Soybeans are by no means a new crop in agriculture. Cultivation of the soybean was recorded in China as far back as 2,838 B.C. and the frequent references to this crop from that period place it among the world's important crops. There is a reference to the introduction of soybeans to France in 1740. In 1790, the first soybeans were planted in the Royal Botanic Gardens in Kew. The first attempt, however, to produce soybeans as a crop in Europe was delayed until Friedrick Hoverlandt published detailed results of his investigations in 1875. Climatic conditions limited successful production in Europe to a minor portion of that continent.

Soybean culture developed in U.S.A. several years later and from less than 50,000 acres in the early years of this century, the average now exceeds 23,000,000 acres with a total crop yield in excess of 450,000,000 bushels.

Soybean Plant

The cultivated soybean is an upright, branching summer-growing annual legume. The numerous varieties vary considerably in maturity, plant type, and colour and size of seed. The trifoliate leaves, stems and pods are densely covered with golden to grey coloured hairs, while the small purple or white flowers are borne in the axils of the leaves. The seed pods usually contain two or three seeds which may vary in colour (according to variety) from cream and yellow, to various shades of green, brown and black. Seed of some varieties will include blends or mottling of these colours.

The soybean plant will provide fodder in the form of green feed or hay, but the principal value of the crop is in the seed. The high oil and protein content of the seed create the demand from the standpoint of industrial processing.

Oil and protein content vary according to variety and growing conditions. Oil content may vary from 15 to 19 per cent. and protein content from 38 to 48 per cent. Low oil content is usually associated with high protein content and vice versa.

Varieties

Generally, the climatic limitations of soybean are similar to those of maize. It has been noted however, that any one soybean variety is usuall adapted to only a short range of latitude Varieties successful in the South Burnet (latitudes 26 deg. to 28 deg. S.) are those usuall obtained from the U.S.A. latitudes 30 deg. t 36 deg. N., although a range of material grow from Canada to the southern border of U.S.A has been tested in field trials.

About 150 varieties of soybeans from U.S.A and South Africa have been tested in the South Burnett during the past 25 years. Less than 10 per cent. of these have proved to be suitabl for commercial production in that district.

Initial observations were made with the objec of selecting varieties suited for (1) commercia seed requirements and (2) green manurial o fodder purposes. Varieties selected for the pro duction of seed require several importan agronomic characteristics in addition to the trad requirements such as oil content, protein conten and satisfactory iodine number of oil. Further more, high yielding ability of seed-producin varieties must be associated with a plant habi suited to direct harvesting by combine harvesters Resistance to serious seed shattering is als essential.

An erect habit at maturity is desirable t facilitate harvesting and it may be advantageou to select varieties with an overall height of a least 18 in. The location of the seed pods o the plant is important. A major problem o direct harvesting is overcome if the seed pod have a minimum clearance of 4 in. from groun level.

The most promising varieties for commercia seed production include Nanda, Yelnand Clemson-non-shatter and Pelican. Recentl introduced varieties and progenies developed i Queensland are now under investigation and i the near future may replace some of the varietie recommended at present.

Nanda.—Average height of 26 in.; maturit approximately 160 days, semi-erect to erect i habit with the crop borne in a range from 4 i to 26 in. above ground level; shattering normall light to medium though occasionally heavy; see fairly large, ellipsoid and slightly flattened, and coloured straw yellow with a light brown to brown hilum.

Yelnando.—Average height 30 in.; maturity approximately 165 days; erect in habit with a cropping range from 7 to 30 in.; shattering very light; seed medium size and straw yellow in colour with a brown hilum.

Clemson-non-shatter.—Average height 22 in.; maturity approximately 165 days; erect in habit with a cropping range from 2½ to 22 in.; seed is medium-sized flattened ellipsoid; colour, straw yellow with light to dark brown hilum; shattering, light to medium; a high yielding variety presenting problems for direct harvesting.

Pelican.—Average height 36 in.; maturity approximately 165 days; erect in habit with a cropping range from 6 to 36 in.; seed small, straw coloured with a brown hilum; shattering generally light.

Varieties selected for green manurial or fodder purposes include Avoyelles, Otootan and Gatan.

Avoyelles.—Semi-erect, free-branching habit maturing in approximately 166 days; shattering light to medium; seed, medium size; black in colour with a black hilum.

Otootan.—Dense vining habit up to 42 in. in diameter and height up to 18 in.; maturity approximately 170 days; shattering, medium; seed small, irregular shape; black in colour with a black hilum.

Gatan.—Similar to Otootan though the vining branches are slightly finer and maturity a few days later; seed medium size, and brown in colour with a brown hilum.

Rotation

The value of a planned system of crop rotation is accepted by most farmers but practised by few. The soybean (a legume) can obtain most of its nitrogen requirements from the air by way of root nodule bacteria. Combine harvesting for grain returns the crop residue to the soil with consequent benefit to soil structure. Soil on which soybeans have been grown is generally loose and friable. This is not so pronounced when other crops are grown.

Soybeans, maize (or grain sorghum), Rhodes or other suitable grass, with additions in accordance with the individual farmer's requirements would provide a beneficial crop sequence on many farms. Cereals can follow soybeans with benefit and the soil requires little preparation before planting the cereal. The cereals may be planted either as a cash crop or alternatively for soil renovation. The cover thus provided will reinforce the loose soil against damage from early summer storms.

The full value of soybeans in the rotation will depend on the return of the plant residue to the soil. If the crop is used for hay the benefit to the soil is reduced accordingly.

Soils and Fertilizers

Fertile loams produce the best yields but satisfactory yields can be obtained from a large range of soils from friable clay loams to sandy loams. Heavy clay soils and soils of low fertility should, if possible, be avoided. Though soybeans are more acid-tolerant than many other legumes, both very acid and alkaline soils are unsuitable. Soybeans are more tolerant to wet conditions than navy beans, maize or sorghum and peanuts.

It may be necessary to apply lime to many soils which have been in cultivation for long periods.

Where soybeans are being grown for the first time in a particular field, the seed should, before planting, be treated with a culture of the specific nitrogen-fixing bacteria responsible for the formation of the nodules.

Phosphate-deficient soils will require an application of superphosphate, and as soybeans use a comparatively large amount of potash, applications of potash may also be necessary.

Care should be taken to avoid placing the fertilizer in contact with the seed.

Cultivation

Successful production of soybeans will depend, as with most other crops, on careful preparation of the land before planting.

Cultivation should be designed to produce a medium-fine, compact seedbed. The absorption and retention of moisture in the subsoil is essential. If adequate moisture is not stored in the soil before planting, the crop will have to depend on rainfall during its growing period. If this is insufficient, crop height and yield will be reduced.

The problem of soil erosion should also be considered and cultivation implements selected to ensure a protective surface stubble.

It is important to control weeds immediately before and after the soybean seedlings have emerged. It is essential that, weather permitting, one or two crops of weeds be destroyed before planting. The possibility of controlling weeds by chemical weedicides is being investigated and recommendations will be issued as they become available.

Time of Planting

Length of day has a marked influence on the development and yield of soybeans.

Other factors to be considered include the normal period of suitable planting rains and the maturity period of the selected soybean variety.

Varieties recommended at present are generally fairly late maturing—up to 165 days, though the number of days to maturity will be reduced by late planting. The period to maturity of mid-December planted crops will be about 10 days less than the same variety planted in mid-November. A corresponding or even greater percentage reduction in yield may also be expected.

In the South Burnett the recommended planting period is from mid-November to mid-December though planting may commence as early as October. If early-maturing varieties are to be planted, the time of planting may be delayed but planting should be completed by the end of December.

Planting

Under favourable soil and moisture conditions, high yields are possible at row spacings of 7 or 14 in. However, drilling at not less than 21 in. is recommended for the seasonal conditions normally experienced in southern Queensland. The 21-in. spacing should be adopted only if the tractor and cultivating equipment can be operated at that spacing.

A minimum of 25 lb. to the acre of medium-sized seed is required when the crop is planted for inter-row cultivation. Where soil moisture is adequate the planting rate could be increased to at least 35 lb. to the acre.

Depth of Planting

Planting rates of soybeans for hay are high. Up to 90 lb. of seed may be required for dense stands. The amount of seed required for 24-in. row spacings will be about 40 lb. and will vary up or down according to seed size.

Hay Stands

The seed should not be planted deep. On heavy soils care should be taken to limit the depth of planting to not more than 2 in. On lighter or sandy soils the depth should not exceed 3 in. The practice, frequently adopted with maize, of planting deep enough to ensure germination when soil moisture is marginal will frequently be disastrous with soybeans. This is particularly the case when heavy rain precedes emergence of the seedling.

Where the soil is inclined to pack, the wheels of the planting equipment should not run over the covered seed.

If the crop is to be planted on sloping land which has not been protected by contour banks, planting on the contour is recommended to reduce crop and soil losses from soil erosion.

The seed may be planted by means of combines or maize planters.

Crop Cultivation

A light harrowing just before emergence will be of value if a crust develops on the soil. Cultivation after germination should be designed to destroy all weed growth. Early morning cultivation or cultivation after rain should be avoided to reduce plant injury. At least one cultivation, but rarely more than two, will be required. Limit hilling to the minimum. Excessive hilling will create a harvesting problem. Sweeps should be used for all late cultivations.

Damage by Hares and Wallabies

The soybean plant is very palatable and will attract hares and wallabies. Areas up to 4 or 5 acres may require netting, but damage in larger areas is rarely an economic problem. Serious damage usually occurs within the first few weeks after emergence.

Harvesting

The leaves usually fall as the crop matures, leaving a plant framework with exposed ripening pods. The crop should be inspected regularly from this stage on and harvesting commenced without delay when the seeds have matured. Shattering of seed may then be avoided and high quality seed can be harvested.

Combine harvesters satisfactorily harvest the varieties recommended. Adjustment to the threshing mechanism should be made to avoid excessive cracking or splitting of the seed. This will involve reduced drum speeds and open or other variations to the concave.

To facilitate preparation of the land for following crops and to obtain the greatest value from the trash, a straw spreader should be used on the combines.

Yields

Yields will vary according to soil and season. Thirty-six bushels to the acre have been harvested from commercial stands in the South Burnett, but the average will probably be between 15 to 18 bus. to the acre. Yields from irrigated areas will normally exceed yields from rain-grown crops by up to 50 per cent.

Storage of Seed

The germination of soybean seed is affected in storage by both temperature and moisture content. American research has indicated that cool dry conditions are essential and the seed should contain not more than 10 per cent. moisture. Even at this moisture content there is usually an appreciable drop in germination percentage after twelve months. Local experience in storage of seed has been similar.

Soybean Hay

No attempt has been made to produce soybean hay in commercial quantities in Queensland. However, soybean hay is produced in large quantities in the eastern states of U.S.A. The crop is also planted in combination with sudan grass for fodder purposes.

The recommended time to harvest for hay varies from flowering to almost mature seed. A general recommendation is to harvest when the seed is half developed. Don't delay if the leaves are beginning to yellow.

If the crop is to be used for green manure, plough in when the seed is formed but before the leaves drop.

Green Fodder or Ensilage

Soybeans alone or in combination with sudan grass have been used succesfully for grazing in the South Burnett. Maize and soybeans, or sweet sorghum and soybeans, also form a satisfactory combination for ensilage.

Crop Prospects

Soybeans have been produced in commercial quantities in Queensland for the past 10 years and there are indications that the acreage planted will be expanded considerably during the next few years.

The development of soybean production to major importance in the cropping programme in Queensland is dependent on new markets in Australia. The only large outlet will probably be in the form of stock foods and oil for industrial purposes. This market will involve reduced gross returns per acre to the grower.

The standard of quality for this market may be less exacting, however, and it is probable that returns could be on a par with maize. Improved production methods, and higher yielding varieties, could therefore encourage large-scale production.

Interest in the stock food and oil market has already been shown by some milling companies.

* * *

Hybrid Maize Varieties

Southern Downs Yields Show Big Increases

By A. G. MARTIN, Agriculture Branch

Many southern Darling Downs farmers are now growing the midseason hybrid maize varieties Q790, Q724 and DS303 with spectacular yield increases of up to 100 per cent. over other varieties.

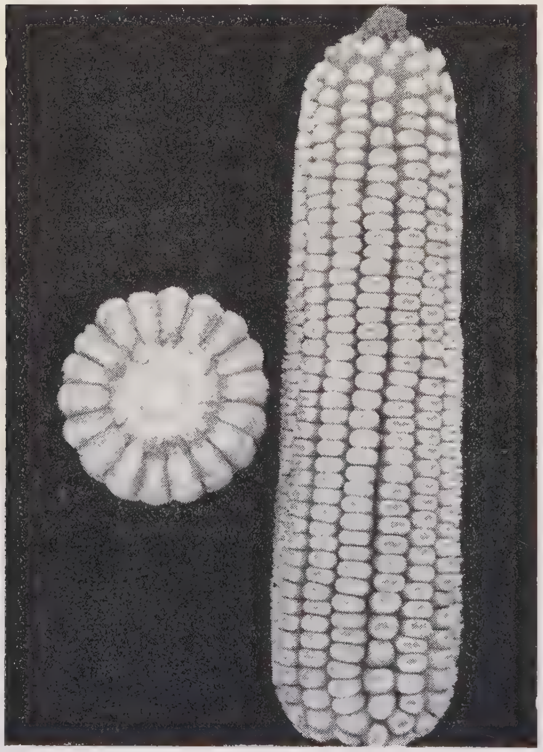


Plate 1

Hybrid Q790. A heavy yielding midseason variety which usually produces two well-filled medium ears with an excellent husk covering. The large uniform grain is a bright yellow colour. Suitable for planting up until mid-December.

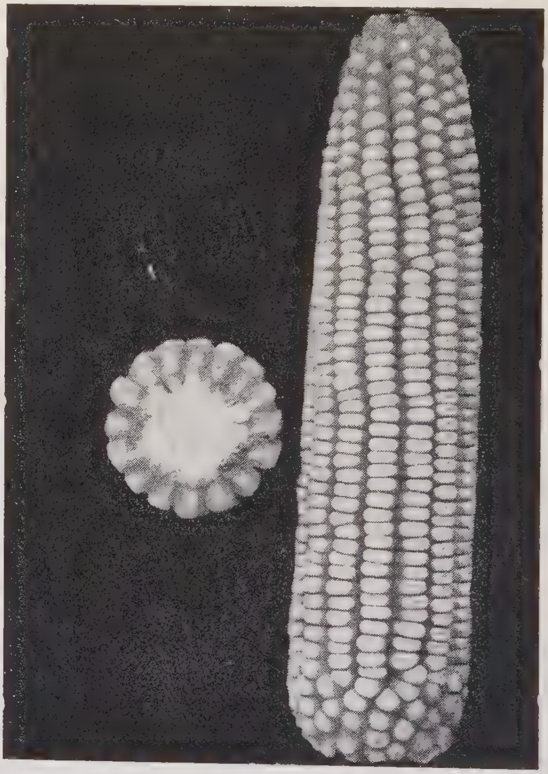


Plate 2

Hybrid Q724. A midseason variety producing high yields of medium to large dark-yellow grain. Suitable for planting up until mid-December.

The hybrids are grown on about 10,000 acres in this district, mostly for grain production. They are seen both on mixed farms and grain farms. Although they are fairly widely distri-

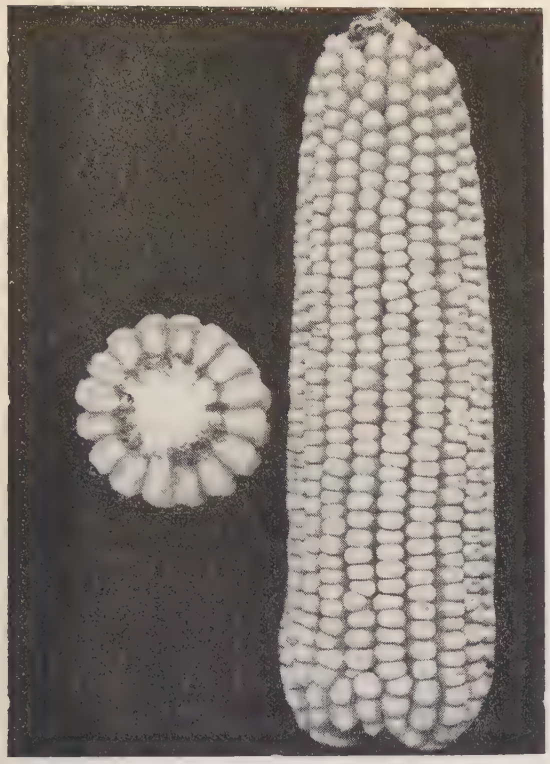


Plate 3

Hybrid DS303. A mid-late variety which is yielding very well on the southern Downs. It has better field qualities than most of the other locally-grown DS hybrids. The ears are medium-sized and the grain is a light-yellow colour. Suitable for planting until the end of November.

buted throughout the district, the bulk of them are grown in the better rainfall areas around Killarney, on the eastern Darling Downs, in the Freestone Valley and in the Clifton-Nobby area.

Owing to climatic conditions, the main planting is carried out fairly late in the season—usually during the November-December period. The practice of planting into stubble in late December and early January is quite common.

This follows the harvesting of barley and wheat crops.

During past years, quick maturing DS varieties have been widely grown on the southern Downs. Such varieties as DS28 and DS99 had proved very popular with some farmers.

Hybrids Well Tested

For several years, the Department of Agriculture and Stock has been intensively testing under field conditions all promising hybrid maize varieties together with popular local varieties to compare their yields and respective field qualities. These trials have been conducted in the Clifton, Freestone and Killarney areas under all extremes of seasonal conditions.

Of the available varieties, Q790, Q724 and DS303 have consistently outyielded all other midseason and quick-maturing varieties. The two Queensland midseason varieties, Q790 and Q724, mature slightly earlier than DS303, but all three share the ability to outyield the early variety DS28 which has been included in these trials as a standard.

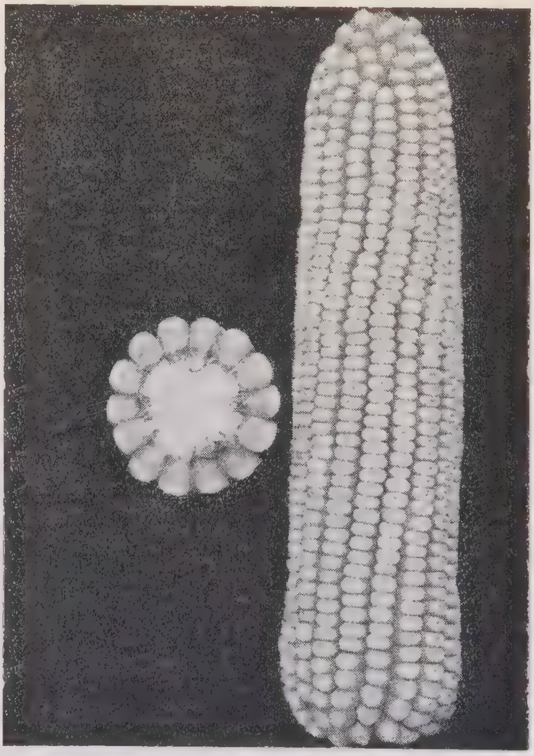


Plate 4

Hybrid Q739. A mid-early variety ideally suited for late planting. The well-filled ears carry a medium-yellow grain.

The popularity of some varieties in the past has been based on early maturity. The district has one of the shortest frost-free periods of all the major agricultural areas in Queensland. Now there is at present a definite demand for fast-maturing varieties for late planting, and Q739 is the best variety available to fill this role at the present time.

In this district, trials are also being conducted by the maize breeding section of the Queensland Agricultural College, Lawes. Last year, 22 early hybrids were compared with DS28. Of these, 20 outyielded DS28 and most matured equally as fast.

The varieties selected from this group, after further testing, should play a major role in future maize growing on the Darling Downs, as present indications reveal that they possess the high-yielding capacity of the midseason varieties coupled with quick maturity—a combination not possessed by any varieties grown here to date.

* * *

This Drug Is Not For Layers

By B. W. MOFFATT, Poultry Adviser.

Nicarbazin is now being widely used for the prevention of coccidiosis in chickens. It is a very efficient drug for this purpose and while it is being used there is little chance of coccidiosis occurring under normal conditions. It is fed to pullets until the birds are within a few weeks of laying but it must not be given after this because of its effect on egg quality.

Plate 1 depicts this effect. The yolk shows extreme mottling. This is common where nicarbazin is fed.

The degree of mottling can vary greatly, but in many cases it would be severe enough to cause the egg to be downgraded. A consumer would certainly discard the egg as "bad."

Discolouring of the white has also been noted in some of these eggs. Some eggs have shown a cloudy white, while others show an amber discolouration.

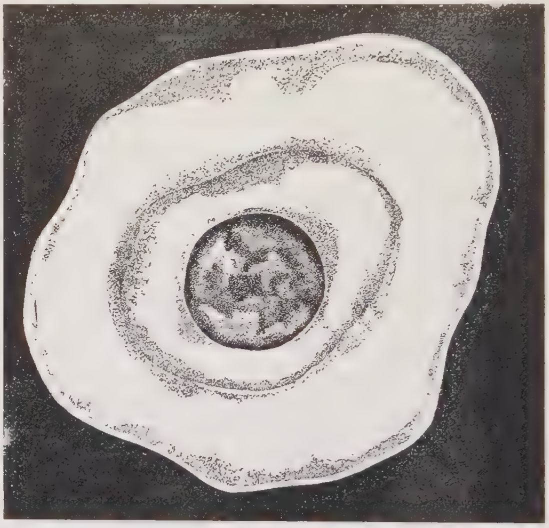


Plate 1: Mottling of Egg Yolk Caused by Nicarbazin, Which Is Used for the Prevention of Coccidiosis in Chickens.

Nicarbazin also tends to prevent the deposition of pigment in the shell of an egg so the eggs from Australorps can be white. This is a minor consideration, but it may act as a warning or a diagnostic point.

Because egg quality is so important if sales promotion programmes are to succeed, care should be taken with this drug. Be sure that layers are not fed a mash meant for chickens. Ensure also that pullets are changed on to a laying ration before laying commences. These little points may save your eggs from being downgraded.

Cleaning Milking Machines in Queensland

By W. C. T. MAJOR, Dairy Technologist.

To produce milk or cream of good quality, it is necessary to wash the milking machines and other dairy equipment immediately after each milking. Firstly, rinse with luke-warm water, then wash with a detergent, and finally rinse in boiling water. When one or other of these three steps is inadequate, two problems follow:

(*a*) The milk or cream produced develops an unpleasant flavour and aroma;

(*b*) The working life of the equipment, particularly the rubber parts, is considerably reduced.

Hard Water Problem

In Queensland, highly mineralised ("hard") waters from bores, wells or streams are frequently used for cleaning dairy equipment. This presents a difficulty, because many widely accepted dairy cleaning combinations are not suited for use with these hard waters.

For example, cleaning combinations containing carbonates react with the minerals in hard water and produce finely divided, heavy precipitates such as the carbonates of calcium and magnesium, which are difficult to rinse from equipment.

Moreover, that portion of the cleaner which has reacted with the water has no further detergent power.

This reduces the power of the solution, or increases cleaning costs (as abnormally large amounts of "cleaner" are required to maintain cleaning strength).

The hard water problem has been studied from three angles:

(*a*) Softening the hard water before use;

(*b*) Developing a cleaning routine which will permit the use of untreated hard water;

(*c*) Conserving alternative supplies of water chemically suitable for cleaning dairy equipment.

It has been amply demonstrated that the residual "hardness" after "softening" is enough to build up milkstone on milking machines and other equipment.

In addition, the composition of hard water varies considerably from time to time. This further complicates the treatment problem.

Softening also adds to both labour and capital costs.

Many chemicals and combinations of chemicals have been investigated, and a satisfactory cleaning routine has now been developed which

(*a*) Reduces the very hard water problem;

(*b*) Permits dairy utensils to be kept in a satisfactory state of cleanliness;

(*c*) Reduces cleaning costs until they approach those of dairies with "soft" water supplies.

Large volumes of rain water run to waste from the roofs of the many buildings on the farm. This soft water can be diverted to large reinforced concrete tanks, which can be built with moulds similar to those used for silo construction.

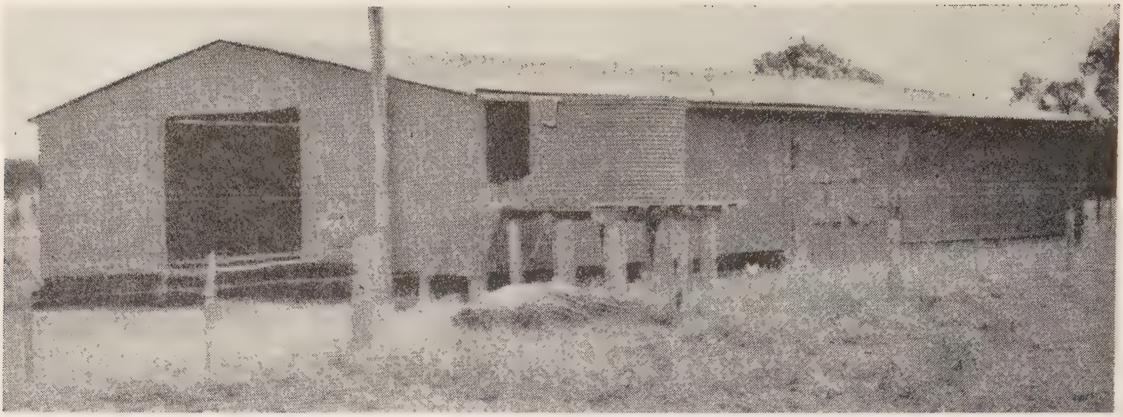


Plate 1

Run-off from the Roof of a Large Farm Building Provides Suitable Water for Cleaning Dairy Equipment.

Provided the concrete is suitably treated, this water will remain soft and suitable for use. It can be either gravitated or pumped to the dairy, where a small centrifugal pump driven by the milking machine engine will elevate it to an overhead tank to facilitate its use.

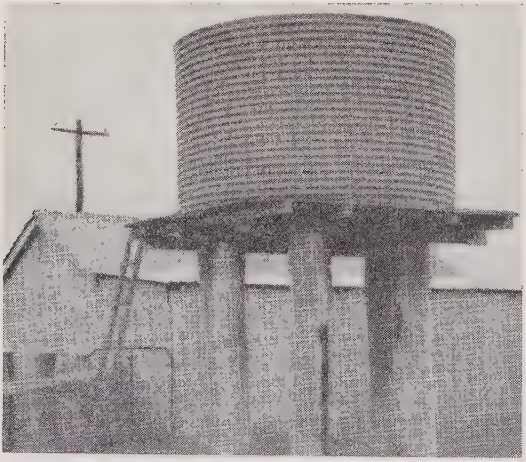


Plate 2

Water Collected at Other Farm Buildings Can Be Gravitated or Pumped to an Elevated Tank for Use at the Dairy.

Highly Polished Equipment

It is uneconomic to clean equipment in poor mechanical condition.

Highly polished surfaces are desirable. They are more easily and more completely cleaned than are unpolished, roughened or pitted surfaces.

Slight tarnish or corrosion greatly increases the tendency for "stone" to build up. Scratched or abraded surfaces build up deposits even more rapidly.

For example, glass pipelines in milking machines have an excellent surface for cleaning and are easily kept bright and clean, whereas corroded metal downdrops or releaser parts will rapidly build up deposits.

It is also most important that rubber parts have a "mirror finish". As soon as the rubber becomes rough, porous or spongy it readily builds up deposits. Rough, porous or ragged surface (or subsurface) finishes are not suitable for dairy equipment.

So, in order to keep equipment clean, it is necessary to discard any equipment that does not have a highly polished smooth, mirror-like finish, whether or not it is glass, metal, rubber or plastic.

A Suitable Cleaner

The cleaning solution must effectively and economically remove residues of milk proteins, fats, and so on from glass, metal, rubber or plastic surfaces. It is usual for the proteins to be partly dissolved and partly dispersed. The fats are usually emulsified.

It is most important that the cleaning solution, together with the dissolved, dispersed and emulsified milk solids (and the precipitates from hard water) will drain freely from the equipment. No scum should remain. Subsequent rinsing is essential to ensure that no solids from the cleaner, the milk, or the water remain on the equipment.

Looking more closely at the characteristics of a suitable cleaner, we find:

Wetting Power: Various chemicals have the power of making a greasy surface as readily "wetted" as is a "non-greasy" surface. Several companies sell "wetting agents" and it is an advantage to include one of them in dairy cleaners as they increase their wetting and penetrating powers.

Causticity: The "causticity" of the chemicals used in dairy cleaners varies considerably. It is a measure of their power to dissolve milk proteins.

Emulsification: Suitable cleaning solutions break the fat films into small globules. These are removed, in suspension, in the cleaning solution.

Deflocculation: It is important that these finely dispersed globules, and other dispersed "soil", are prevented from re-aggregating to form scums which adhere to the surface of the equipment as the cleaning solution drains away. Such scums are difficult to remove.

Suspension: It is equally important to keep in suspension the insoluble "soil" collected by the cleaning solution. Unless this is done, it settles onto the equipment and is difficult to remove.

Rinsibility: If the cleaning solution is not "free-rinsing", traces remain on the equipment after cleaning. When the equipment dries, a film of powder remains on it. Although at first easily wiped off, it rapidly builds up and with the aid of milk solids develops into a hard, difficult-to-remove deposit. Insufficient final rinse water creates a similar problem.

Corrosive Action: If the cleaning solution corrodes the surface the effective work life of the equipment is reduced, the surface of the equipment becomes more difficult to clean and sterilize and traces of the metal removed during corrosion can accelerate chemical changes which reduce the palatability of milk and milk products. Several chemicals can be added in cleaning solutions to guard against corrosion.

Strength of Solution: It is desirable that the strength of the cleaning solution be maintained during use.

Bactericidal Power: Some chemicals used in cleaning solutions have a bactericidal or germ-killing power, but the chief bactericidal actions depend upon the temperature of the cleaning solution during use, the duration of its contact with the equipment, and the physical removal of bacteria from the equipment during cleaning.

Foaming: Excessive foaming is undesirable because of the difficulty of removing foam by rinsing. Therefore, do not use too much "cleaner" in the solution. Do not incorporate excessive amounts of "wetting agent" in the cleaning mixture.

Useability: The farmer must immerse his hands in cleaning solutions to brush those utensils which are not rinse cleaned. It is important, therefore, that the cleaning solution does not adversely affect the farmer's hands.

Plate 3

A Large, Bricked-In Copper, with a Lid, Can Provide an Adequate Supply of Boiling Water at the Dairy.

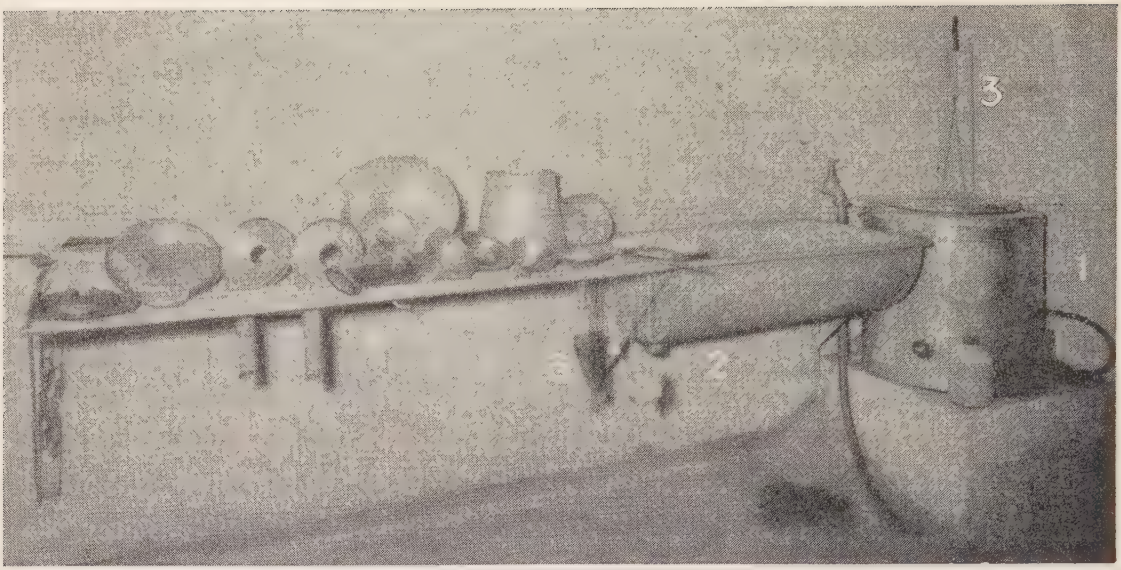


Plate 4

(1) Electric water heating unit with a booster switch to provide water at a temperature of not less than 200 deg. F.

(2) Solidly constructed wash-up trough, large enough to hold a milk or cream can.

(3) Adequate supply of suitable brushes.

(4) Metal draining rack in a position not exposed to dust.

Abrasion: It is unwise to include abrasive agents in dairy cleaners. Smooth "mirror finish" surfaces clean readily, but roughened, scratched or abraded surfaces build up deposits and increase cleaning difficulties.

Cost: Assuming that mixing, packaging and merchandising costs for various mixtures are comparable, the cost to the farmer will be largely influenced by the relative costs and amounts of the various chemicals present in the cleaner. Therefore, before more expensive chemicals can be preferred to cheaper chemicals, the dearer chemicals must give a very much better field performance over a considerable period than does the cheaper mixture.

Toxicity: The only chemicals which can be used in cleaners are those which are non-toxic to humans in the traces normally found in milk flowing over cleaned utensils.

Cleaning Requisites

For efficient cleaning of milking machines and equipment the following requisites are necessary:

1. *Water Supply:* To clean a three-unit milking machine twice daily, using the routine recommended, would require at least 6,500 gal. of water a year. Unless an adequate alternative supply of soft water is available, it is desirable to erect a reinforced concrete tank large enough to hold sufficient run-off from the various farm buildings. This water, is, chemically, the most suitable water for cleaning, provided the concrete tank is treated in such a way as to prevent it making the water hard. This supply is supplemented by bore, well, river or dam water for washing the concrete floors of the shed and yards and for drinking water for the dairy herd. When such facilities are not available, hard water from bores, wells and rivers, must be relied upon. Even with

modern cleaners, such waters do not give a perfect cleaning, but the results are much better than with such cleaners as washing soda.

2. *Water heating devices:* For effective cleaning, it is necessary to have an adequate supply of boiling water from either a bricked-in-copper, with a lid (see Plate 3), or a water heating unit capable of delivering either water at not less than 200 deg. F. (Plate 4) or steam under pressure (Plate 5). These units may be either electrically heated, oil fired or wood fired.

3. *Wash-up Trough:* It is desirable that the wash-up trough should be large enough to take a milk can, and made so that the first compartment contains the cleaning solution, and the second compartment contains water at not less than 190 deg. F. (Plates 4 and 5).

4. *Brushware:* A supply of brushes designed for cleaning the various pieces of dairy equipment is essential. Good quality nylon-type fibre brushes are more suitable than are natural fibre brushes (Plates 4 and 5).

5. *Draining Rack:* After the equipment has been washed, it should be stored in such a manner that it drains easily, air can freely circulate through it, and it remains relatively free from dust. Plates 4 and 6 illustrate suitable pipe and chain wire drainage and storage racks.

Removal of Milkstone

Before satisfactory cleaning can be achieved, milkstone must be removed from the equipment. Where very hard waters cannot be avoided for cleaning, it has been found that, if cleaning is to remain economic, some build-up of stone will occur. It will, therefore, be necessary to use intermittently an acid cleaner to soften the stone.

The interval between acid treatments varies from a few days to several months, depending on the amount and nature of the hardness of the water and the chemical composition of the cleaner. Departure from the recommended cleaning routine frequently markedly accelerates the rate of build up of stone.

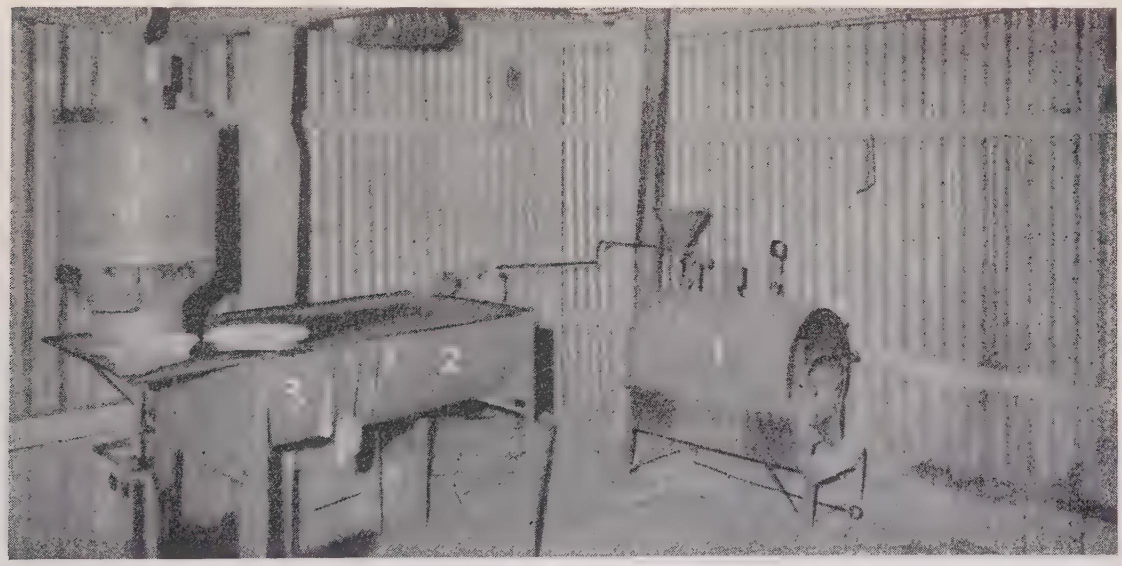


Plate 5

(1) Water heating device capable of delivering water at not less than 200 deg. F. or steam under pressure.
(2) Solidly constructed wash-up trough large enough to hold a milk or cream can.
(3) Adequate supply of suitable brushes.
(4) Can in position for steam sterilization after having been cleaned.

Plate 6

A Suitable Metal Storage Rack for Milk or Cream Cans in a Dust-Free Position in the Wash-Up Room at the Dairy.

The method of removing milkstone is as follows:

Step 1: Disconnect the long rubbers from the claws of the teat cups. Remove all the milk-line down-drops and long rubbers from the machine, except the milk down-drops for the unit furthest from the releaser. Turn off the milk taps. Connect all the milk down-drops and long rubbers in such a manner as to form a "hose" running from the end of the overhead milk-line towards the releaser. Then remove all the air-line down-drops and long rubbers. Plug the short airline rubbers, or turn off the airline taps. Connect the airline down-drops and long rubbers to the end of the milk-line "hose". Place the end rubber in a bucket under the releaser.

Step 2: Prepare an acid rinsing solution by adding 250 ml. (9 fluid ounces) of spirits of salts, to 2 gal. of water at not less than 190 deg. F.

Step 3: Start the plant and add the acid solution to the bucket under the releaser. Open the farthest milk tap and permit the solution to be drawn through the plant. Remove the outer releaser flap, and fill the releaser dome. (If the hand is placed on the dome, the position of the hot solution can be accurately determined). Then replace the outer releaser flap and hold it down temporarily to fill the spit chamber of the releaser. Then release the outer flap and permit the releaser to discharge. While the acid is circulating, rotate each overhead milk pipe one-eighth of a turn each 30 sec. This is necessary as the overhead milk pipe is only partly filled by the acid solution. Five minutes' recirculation is ample—as the acid is usually "killed" within 5 minutes, and the temperature of the solution has also dropped considerably. Draw a milk-line brush through the milk-line each minute during recirculation.

Step 4: Prepare an alkaline rinsing solution by dissolving 2 level tablespoons of sodium metasilicate in 2 gal. of water at not less than 190 deg. F.

Step 5: Repeat all of step 3, using the alkaline solution.

Step 6: Dismantle the machine and brush the various parts. If the deposit does not easily brush out, repeat steps 2, 3, 4, 5 and 6 until the plant is clean. On bad plants, two treatments have been necessary.

The solution strength given is quite safe for general use in the method outlined, and stronger solutions are unnecessary. No deposit has yet been encountered which cannot be softened by this method. However, in no instance can the softened deposit be rinsed from the machine. Brushing is always necessary.

Step 7: To complete the clean-up, remove the various rubber rings flaps, and soak them and the claws, other metal fittings, and other utensils in hot acid solution for 5 minutes. Then soak them in hot sodium metasilicate solution (2 tablespoons in 2 gal.) for 5 minutes. Then brush them. Where the equipment is too large for soaking, its surface can be brushed—firstly with the acid solution, and then with the alkaline solution—until it is cleaned.

Step 8: Re-assemble the cleaned plant and rinse with water at not less than 190 deg. F., using 1 gal. per unit.

Warning

Exercise care in the storage and use of spirits of salts as it is corrosive and dangerous. Keep it away from children. Do not treat aluminium parts with spirits of salts. In case of accidents, wash copiously the affected parts with clean water; obtain medical attention if necessary.

Normal Cleaning Routine

Immediately Before Milking.—After the equipment has been assembled, it is rinsed with water at a temperature between 90 and 110 deg. F., which has been either treated with a chemical sterilant or has been previously boiled. If the copper is filled with water after use, the lid placed over it, and sufficient wood added to the fire to ensure that the water boils, a copper full of safe water will be available for pre-milking rinsing, although the fire will have given out between milkings.

It is unwise to use water of doubtful purity as a pre-milking rinse.

Immediately After Milking:

(*a*) *Cleaning Without Recirculation*:

Step 1: As soon as the last cow is finished in each bail, turn off the air and the milk taps. Then wash the outside of the cups, claws and long and short rubber tubes with detergent solution at 120 deg. F. Then rinse with water at a similar temperature. Then proceed immediately to step 2.

Step 2: Draw through each set of cups 1 gal. of water at 90 to 110 deg. F. It is important that the machines and utensils are rinsed as soon as milking ceases. A wet film of milk is relatively easy to remove by rinsing, but not when it is allowed to dry.

Rinse cleaning of the milking machine commences by drawing water into the unit nearest the releaser. The reason for this is the "backward surge" which is readily seen where glass lines are used.

During rinsing, raise the outer flap of the releaser until the releaser dome is almost full of water. Then replace the outer flap and hold it down momentarily to fill the releaser spit chamber. Then release it and permit the releaser to work normally. Unless this is done the heat released during subsequent steps will "bake on" the film of milk on the releaser, thus increasing the difficulty of subsequent cleaning. Use clean water for rinsing the utensils to be hand-washed.

A torpedo brush is passed up and down the overhead milkline during step 2.

Step 3: Draw through each set of cups 1 gal. of the cleaning solution at 180 to 190 deg. F. As in step 2, flood the releaser during rinsing. Periodically raise the cups out of the cleaner during rinsing to permit air to enter and induce surging. The cleaning solution recommended is prepared by dissolving in each gallon of hot water, 1 level teaspoon of a mixture of 4 parts of sodium metasilicate and 1 part of "wetting agent." The cleaning solution is collected in the vat. The vat is brushed and the solution is then transferred to the first compartment of the wash up trough where it is used for washing the remaining previously rinsed dairy utensils, such as separator parts, cooler, buckets, strainers, cans, lids.

Step 4: Draw through each set of cups 1 gal. of water which enters the machines at a temperature of at least 190 deg. F. Do not flood the releaser during this step. After hand washing the remainder of the utensils, cover them in the second compartment of the wash-up trough with water at not less than 190 deg. F. The utensils can be removed with a metal hook (made from ⅜-in. round mild steel rod) and placed on the appropriate drainage and storage rack in a dust-free position.

Step 5: Remove and dismantle the releaser and vacuum tank. Place them on a storage rack. Open the various flaps, plugs, and taps of the milking machine. Disconnect the long air and milk rubbers from the corresponding metal downdrops. Hang the rubberware in such a position that it drains completely in a dust-free position where the rubber is not exposed to direct sunlight.

(*b*) *Cleaning With Recirculation*:

Before commencing recirculation cleaning, it is essential to thoroughly clean both the airline and the milkline of the milking machine. Adaptors are required to transfer the recirculating solutions from the airline to the milkline. It is also usual to install a tap in the airline to facilitate the entry of the cleaning solutions.

Milking machines can be kept clean either with or without recirculation, provided a correct method is used. However, when "short cuts" are taken, unsatisfactory results are obtained, whether or not recirculation is used.

The following is a suitable method for recirculation cleaning:

Step 1: As soon as the last cow finishes in each bail, turn off the air and milk taps. Then wash the outside of the cups, claws and long and short rubber tubes with detergent solution. Then rinse with water.

Step 2: Set up the plant for recirculation cleaning. The method of setting up varies from model to model and from make to make. Follow the fitters' instructions.

Step 3: Draw water at 110 deg. F. into the airline of the plant and permit it to run to waste until it is clear. **Do not recirculate this first rinse.** Flood the releaser towards the end of this rinse. If air is admitted to the machine while the releaser is flooded it causes violent agitation which increases the effectiveness of this rinse. The spit chamber is then flooded, and finally the water is discharged. The amount of water varies with the layout of the machine (usually ¾ to 1 gal. is required for each set of cups).

Step 4: The cleaning solution (1 level teaspoon of mixture of 4 parts sodium metasilicate and 1 part of wetting agent per gallon of water) at not less than 190 deg. F. is placed in a bucket or other container under the releaser. The cleaning solution is then drawn into the airline through a piece of rubber tube and a specially installed tap. This solution is recirculated for 5 min. The cleaning solution passes down the airline to the claws where it is transferred to the milkline. It then passes along the milkline to the releaser, where it is discharged. Towards the end of recirculation, flood the releaser and admit air to facilitate cleaning. Then flood the spit chamber. Finally discharge the cleaning solution.

Step 5: Draw hot water (at not less than 190 deg. F.) into the airline. **Do not recirculate this rinse.** Do not flood the releaser.

Step 6: Empty the vacuum tank. Dismantle and open the machine to permit it to drain and dry as for normal cleaning.

The remainder of the utensils are cleaned in the same manner as for the normal rinse cleaning procedure.

A Recommended Cleaner

A mixture suitable for cleaning milking machines and farm dairy utensils can be prepared by mixing 4 parts of sodium metasilicate with 1 part of "wetting agent", and using 1 level teaspoon of mixture to each gallon of hot water. The mixing may be done before use, as is the case with some prepared detergents, or the chemicals may be added separately to the bucket of hot water used for cleaning.

Some other mixtures will give comparable results, but at increased cost.

The recommended mixture will considerably reduce, but not avoid, stone formation with excessively hard water supplies. (Such waters also form stone with the more expensive mixtures). Where it is necessary to use very hard water, it will also be necessary to periodically remove the stone formed on the dairy equipment. Spirits of salts is recommended to soften the stone so that it can be easily brushed out of the equipment.

The use of other mixtures is not forbidden. The object is to obtain clean equipment. How this is done is a matter for the dairyman. The methods outlined give an economic way of achieving satisfactory results. There are also other ways, but those investigated were either more expensive or less effective.

Under Queensland conditions, wherever the water used for cleaning is hard, it is suggested that consideration be given to the erection of treated, reinforced, concrete tanks to collect the roof run-off from farm buildings. These correctly treated tanks provide a supply of water which is, chemically, more suitable for use in dairy equipment cleaning than is the hard water from many wells, bores or streams.

Jubilee Celebrations At Animal Research Institute

By A. L. CLAY, Director, Division of Animal Industry

On December 2, 1959, in the presence of a representative gathering drawn from organizations and firms connected with the livestock industries, the University, C.S.I.R.O. and Government departments, the Hon. G. F. R. Nicklin, Premier of Queensland, unveiled a plaque set in the wall of the entrance hall at the Department's Animal Research Institute, Yeerongpilly. The plaque commemorates the 50th anniversary of the establishment of a stock experiment station at Yeerongpilly.

The Premier referred to the importance of the livestock industries to the economy of Queensland. For the past several years they have averaged £140,000,000 worth of production or 54 per cent. of the total rural production of Queensland.

The original stock experiment station had been brought into being largely because of the challenge of cattle ticks and tick fever to the successful raising of stock. From that beginning, the Institute had built up an imposing record of service and achievement which was well known not only throughout Australia but also overseas.

It was most essential that all possible attention be given to ways and means of combating those hindrances to the health of animals that still cause serious losses, the Premier said.

Work on Tick Fever

The Hon. O. O. Madsen, Minister for Agriculture and Stock, who proposed a vote of thanks to the Premier, made reference to the research work on tick fever currently in progress at the Institute. Although a method of immunisation against the infection had been worked out many years ago, it was not completely satisfactory, he said. An important new programme of research on the problem was now under way and there were indications that the whole procedure of immunisation might soon be put on a sounder basis. This was calculated to be of immense value to the cattle industry of Queensland.

Pests and diseases were with us continuously, the Minister said. Periods of feed shortage occurred every year and drought was ever ready to strike. Without an institute such as Yeerongpilly, gradually eliminating or reducing the many hazards and at least keeping abreast of the scourges besetting the livestock industries, their plight would indeed be a sorry one.

Diagnosis of Disease

The Director-General of the Department, Dr. W. A. T. Summerville, spoke on the organization of the Institute and the many different services provided by the three branches, Pathology under the direction of Mr. L. G. Newton, Biochemistry under Dr. J. M. Harvey, and Husbandry Research under Mr. J. W. Ryley.

Although called the Animal Research Institute, and research is indeed an important function of the Institute, the greater part of the time of the staff is taken up in the routine diagnosis of disease conditions, he said.

The Department has about 150 stock and slaughtering inspectors in the field, not to mention some 20 veterinary officers. From these

Plate 1

Director of the Pathology Branch of the Institute, Mr. L. G. Newton, Shows a Specimen to the Premier of Queensland, Hon. G. F. R. Nicklin, and the Minister for Agriculture and Stock, Hon. O. O. Madsen, at the Jubilee Celebrations Held at the Department's Animal Research Institute at Yeerongpilly.

[*"Courier-Mail" photograph.*

men and upwards of 40 veterinary practitioners, comes a never ending stream of specimens to the Institute. No less than 5,168 separate batches of specimens were examined in the year 1958-59.

The value of the diagnostic service provided to the livestock industries by the Institute is almost beyond price. There can be few more disturbing happenings on farm or station than the loss of valuable livestock from causes unknown—unknown that is, to the farmer or grazier; but the knowledge that there is a field diagnostic service available to him with the full resources of the Institute behind it, must surely be a great comfort.

The Institute is proud of its role in this regard and happy to acknowledge that if needs be, diagnostic work in general must take priority over research. Actually much of the research carried out springs directly from problems encountered in the diagnostic area so that the two are really very closely related. The research work carried out at the Institute is essentially applied research and the results obtained, of immediate benefit to the livestock industries.

History of the Institute

The following material is drawn directly from a booklet specially prepared for the 50th anniversary celebrations:

In 1888 a deputation of stockowners approached the then Colonial Secretary, the Hon. B. B. Moreton, to press for the establishment of a laboratory to study diseases and other problems of both animals and plants. Some three years later the Queensland Graziers and Stock Breeders' Association urged the formation of a laboratory.

In 1893, the Executive Council approved the establishment of a Stock Institute for Queensland and appointed Mr. Charles Joseph Pound, F.R.M.S., Director. The Minute of the Colonial Secretary establishing the Stock Institute, stated as its object " . . . the discovery by means of experimental research of the nature and origin of diseases in stock and the means of their prevention".

The first Stock Institute was located in rented premises in Turbot Street near North Quay, Brisbane. The volume of work rapidly increased and in 1899 a new building in College Road, Brisbane, was occupied. In 1900 control of the Institute was transferred to the Home Secretary's Department and its title changed to Bacteriological Institute. The Department of Agriculture and Stock resumed control of the Institute in 1907.

In 1909 the need for sufficient space to accommodate large animals for experimental purposes became urgent; 56 acres of land at Yeerongpilly were then acquired and the Stock Experiment Station established. Mr. (later Dr.) Sydney Dodd, M.R.C.V.S., was placed in charge with the title of Principal Veterinary Surgeon and Bacteriologist. In relation to this the Annual Report of the Queensland Department of Agriculture and Stock 1909-10 states—

> "Queensland may congratulate itself upon being the first State to possess a thoroughly equipped Station to deal with the epizootic diseases in stock, and research work in connection therewith."

With the resignation of Mr. Dodd on March 31, 1910, Mr. C. J. Pound was transferred from the Bacteriological Institute and took charge with the title of Government Bacteriologist. Mr. A. H. Cory, M.R.C.V.S., was made responsible for the supervising of veterinary work at the Station.

Following Mr. Pound's retirement on August 1, 1932, Mr. James Arthur Rudd, L.V.Sc., was appointed to take charge of the Station on June 22, 1933. At this time its designation was changed to Animal Health Station. Mr. Rudd retired on August 29, 1941. Dr. John Legg, B.Sc., D.V.Sc., M.R.C.V.S., then became Director (later Director of Research), a position which he held until his retirement on February 11, 1957, except for a period from May 1945 to June 1947 when Dr. F. H. S. Roberts, D.Sc., was Acting Director.

The laboratory built in 1909 was vacated in July 1945, and the former premises of the University of Queensland Veterinary School, located in the same area, were occupied.

In the period 1951-53 the Biochemical and Toxicological Sections of the Agricultural Chemist's Laboratory were transferred from the Head Office of the Department to the Animal Health Station. However, they continued as part of the Division of Plant Industry. In 1956 these two sections were combined to become the Biochemical Branch of the Division of Animal Industry.

In 1952, to meet the increasing need for research into animal husbandry, 360 acres of land were purchased at Rocklea (approximately 2 miles from the Yeerongpilly site). This was followed by the establishment of a Husbandry Research Section of the Station with Mr. A. K. Sutherland, B.V.Sc., M.S., Chief Husbandry Officer in charge. In the following year the name Animal Health Station was changed to Animal Research Institute to correspond with the wider functions discharged.

Subsequent to Dr. Legg's retirement in 1957, the Biochemical Branch was included in the Animal Research Institute which then comprised three Branches—Pathology, Husbandry Research and Biochemical, with a common administration section.

In addition to headquarters at the Institute, the Pathology Branch has a regional laboratory located at Oonoonba, Townsville. This laboratory was opened on April 25, 1914, under the control of Mr. G. Tucker, M.R.C.V.S. It is now known as the Oonoonba Animal Health Station and provides a service for those areas of the State from Mackay northwards.

* * *

FARM SAFETY

Familiarity can breed contempt, but when you are dealing with bulls you should be careful at all times.

Accidents, some of them fatal, happen every year because stockmen and farmers fail to treat their bulls with respect.

Keep your eye on the bull!

Take A Look At Yellowberry!

By S. L. EVERIST, Government Botanist

Here is a description of Yellowberry (Rubus ellipticus) which recently was declared noxious throughout the State under the Stock Routes and Rural Lands Protection Acts:

Yellowberry is a coarse bramble with a habit of forming dense thickets. There are two kinds of stems, primary canes and flowering canes. The primary canes are stout, growing upright at first, then bending over at heights varying from 3 to 8 ft. and dropping down to the ground again, where they take root and form new crowns from which more primary canes arise.

The primary canes are densely covered with stiff, bristle-like hairs, reddish or brownish in colour and, in addition, have scattered hooked prickles.

The flowering canes are short and slender and come out from the forks of leaves along the primary canes. They also have bristly hairs and scattered prickles.

The leaves consist of three leaflets, the side two with short stalks and the end one with a longer stalk; those on the primary canes are 2 to 4 in. long and 1 to 2½ in. wide; those on the flowering canes are generally smaller.

Each leaflet is dark glossy green on the upper surface and paler underneath. The veins are prominent—sunken on the upper surface, raised on the lower. The leaflets are elliptic in outline, rounded at both ends, the edges finely and sharply serrated.

The flowers, borne in groups at or near the ends of the short flowering canes, have 5 white petals: the fruits resemble blackberries in size, shape and texture but are pale yellow in colour.

Distribution

A native of southern Asia, Yellowberry was first reported to be growing wild in Queensland near Eumundi in 1912. It spread slowly on to other parts of the Blackall Range and is now plentiful there. In recent years it has begun to spread rapidly on the range itself and the lower slopes towards Nambour and Palmwoods. Isolated patches have also been reported as far north as Maryborough and as far south as Pimpama.

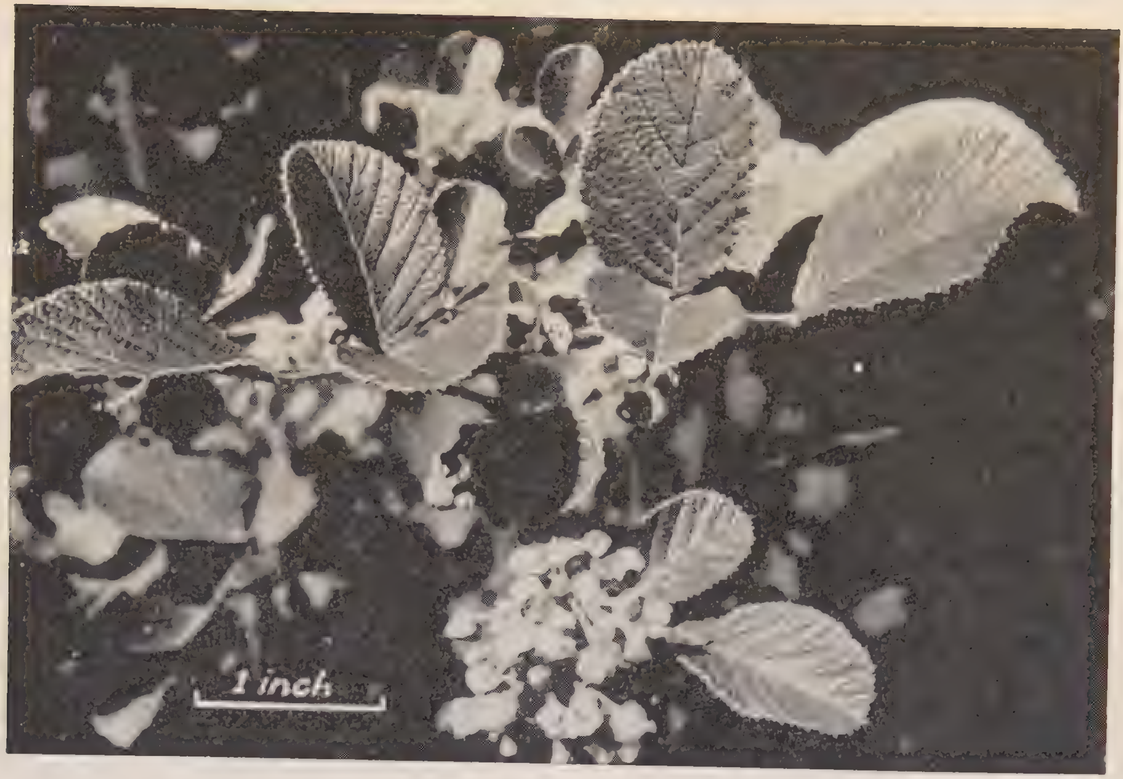
If the plant is allowed to spread it could become a serious pest on much of the good dairying country of the coastal belt. The fruit is edible and is spread by birds.

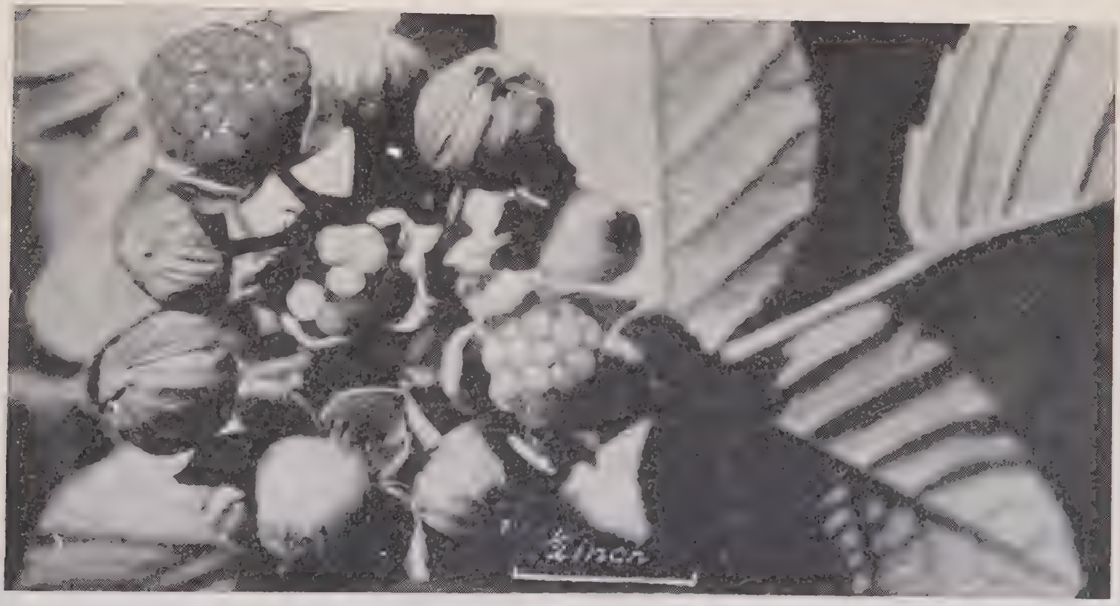
Control

Despite its fearsome appearance, Yellowberry is one of the easiest brambles to kill with hormones. It can be killed with 2,4,5-T or mixtures of 2,4-D and 2,4,5-T, provided the spraying is thorough.

If you use a 40 per cent. 2,4,5-T, mix 1¼ fluid oz. to 3 gal. of water (1:400) and spray the bushes until they are wet. If you use a mixture of 2,4-D and 2,4,5-T, double the amount of hormone.

Most of the sprayed plants will die and the few survivors can be sprayed again later. Do not burn the sprayed plants for at least 6 months after treatment. Spraying should be followed up with grass planting when the bushes are dead.





TOP: Flowering Cane of the Yellowberry (*Rubus ellipticus*). BOTTOM: Cluster of Yellowberry Fruits.

Herd Recording In 1958-59

By S. E. PEGG, Chief Adviser, Herd Recording

During the 1958-59 herd recording year, 43,412 cows from 1,259 herds completed recorded lactations under the Group Herd Recording Scheme, for a record average production of 402 gal. of milk and 170 lb. of fat.

Following the 1957-58 drought, most of the dairying districts received fair rains. Although the rainfall was below average it was well distributed. As a result of the improved conditions it was expected that the membership of herd recording groups would increase. However, the low price ruling for dairy produce overseas in August and September, 1958, had a depressing effect on the dairying industry. This waning of interest, allied with the increase in herd recording fees in October, 1958, curtailed the number of farmers practising herd recording. In order to reduce costs, several groups below strength were amalgamated. The number of groups fell from 78 to 72 during the year.

The average production of 4,022 lb. milk and 170 lb. fat is the highest recorded in this State. The previous highest was in 1955-56, when the average production was 3,563 lb. milk and 155 lb. fat.

The higher production this year can be attributed partially to the seasonal conditions, but it is also considered that herd owners have made use of herd recording information to improve their farm and herd management.

The high prices ruling for cow meat for the American trade has provided a profitable outlet for culled cows. Recording farmers have been able to dispose of their lower producing animals at a remunerative price.

Of course, all dairymen have been at liberty to sell culled cows on this market, but farmers who have not been recording have relied on personal observation to select their culls. Thus, it is quite possible that they may have unwittingly sold some of their higher yielding cows and retained the lower producing animals.

One point to remember is that although culling may increase the average production per cow it may not increase the overall production from the farm. This situation could arise if the property is understocked and cows are obtaining ample feed. When replacement stock are introduced their productive ability must exceed that of the culled animals. Culling is only successful if associated with good farm management.

The total completed lactation and average yield per cow for each year since 1948 are given in Table 1.

TABLE 1

Year	Herds	Lactations	Average Production per Cow		
			Milk (lb.)	Test (%)	Butterfat (lb.)
1948–49 ..	507	17,216	3,289	4·3	144
1949–50 ..	715	22,392	3,523	4·3	152
1950–51 ..	814	26,798	3,312	4·4	146
1951–52* ..	818	23,123	2,657	4·2	112
1952–53 ..	1,073	34,304	3,467	4·3	150
1953–54 ..	1,202	41,378	3,143	4·3	134
1954–55 ..	1,266	45,734	3,486	4·3	150
1955–56 ..	1,412	54,352	3,563	4·3	155
1956–57* ..	1,466	59,711	3,508	4·2	149
1957–58* ..	1,217	43,726	3,449	4·1	143
1958–59 ..	1,259	43,412	4,022	4·2	170

* Drought year.

Table 2 shows the number of cows, according to age groups, which completed recorded lactation periods of 300 days or less, and their average production.

TABLE 2

Age Group	Cows	Average Production per Lactation		
		Milk (lb.)	Test (%)	Butterfat (lb)
2-year-old ..	6,122	3,340	4·3	145
3-year-old ..	4,760	3,689	4·3	159
4-year-old ..	4,305	4,081	4·3	175
Mature	19,247	4,342	4·2	182
Unknown age ..	8,978	3,950	4·2	164
Total ..	43,412	4,022	4·2	170

A total of 8,978 cows, or 20·7 per cent., are shown as being of unknown age. This is the same percentage as in the previous year. It is very disappointing to find that the age of one cow in every five is not known. This deficiency reduces the effectiveness of the production records for survey purposes.

Length of Lactation

The average length of lactation was 243 days or approximately eight months. This is a big improvement compared with previous years. Although the 1957-58 average was 247 days, it had previously varied from 203 to 230 days. As there is a correlation between production and length of lactation, dairymen should strive for a milking period of 10 months. If this is not attainable immediately, a minimum of nine months should be the initial aim.

The average length of lactation each year since 1948 is shown in Table 3.

TABLE 3

Year	Length of Lactation (Days)
1948–49	220
1949–50	223
1950–51	203
1951–52	209
1952–53	210
1953–54	211
1954–55	224
1955–56	229
1956–57	230
1957–58	247
1958–59	243

The average length of lactation for each of the areas in the State is shown in Table 4.

TABLE 4

District	Length of Lactation (Days)
Atherton Tableland	256
Mackay	252
South-Eastern Queensland	246
Eastern Downs	243
Western Downs	233
Central Burnett	249
Dawson-Callide	240
South Burnett	239
Port Curtis	234
Upper Burnett	239

Production in Each Group

The average production for each Herd Recording Group is shown in Table 5.

TABLE 5

GROUP HERD RECORDING FOR 1958-59

District/Group	Herds	Cows	Average Length Lactation (Days)	Average Milk (lb.)	Average Test (%)	Average B/Fat (lb.) 1958–59	Average B/Fat (lb.) 1957–58
Atherton Tableland	*54*	*1,815*	*256*	*3,963*	*4·1*	*160·6*	*168·3*
Malanda No. 1	9	399	256	4,625	4·1	190·2	199·8
Malanda No. 2	16	420	257	3,740	3·8	141·9	149·8
Malanda No. 3	12	411	259	3,980	4·0	157·5	174·5
Millaa Millaa	17	585	254	3,668	4·3	156·1	155·8
Mackay	*19*	*551*	*252*	*3,052*	*4·4*	*133·2*	*137·9*
Port Curtis	*55*	*1,512*	*234*	*2,916*	*4·5*	*131·0*	*119·3*
Mount Larcom	19	598	223	2,714	4·3	117·7	100·5
Rockhampton	15	437	243	3,109	4·6	143·9	136·7
Bundaberg No. 1	11	197	245	3,275	4·5	147·8	129·3
Bundaberg No. 2	10	280	234	2,793	4·6	127·6	130·1
Dawson Callide	*52*	*2,391*	*240*	*3,504*	*4·3*	*152·3*	*117·4*
Biloela No. 1	17	958	250	3,660	4·6	166·6	118·6
Biloela No. 2	18	760	243	3,617	4·2	153·6	138·9
Wowan	17	673	223	3,154	4·1	130·4	102·5
Upper Burnett	*35*	*1,542*	*239*	*3,797*	*4·7*	*176·6*	*124·5*
Monto No. 1	15	744	235	3,579	4·6	163·5	118·2
Monto No. 2	20	798	243	4,001	4·7	188·7	129·3

GROUP HERD RECORDING FOR 1958-59—*continued*

District/Group	Herds	Cows	Average Length Lactation (Days)	Average Milk (lb.)	Average Test (%)	Average B/Fat (lb.) 1958–59	Average B/Fat (lb.) 1957–58
Central Burnett	*34*	*1,114*	*249*	*3,866*	*4·4*	*169·5*	*141·1*
Biggenden	17	562	248	3,955	4·4	174·4	162·0
Mundubbera	17	552	251	3,775	4·4	164·5	124·0
South Burnett	*217*	*8,073*	*239*	*4,159*	*4·1*	*170·0*	*137·3*
Durong–Wondai	17	936	241	4,465	3·9	176·3	156·4
Kilkivan	18	668	235	3,345	4·4	146·5	109·6
Kingaroy	23	719	240	5,031	3·9	195·7	141·5
Kumbia–Ironpot	18	792	239	4,404	3·8	165·9	140·7
Murgon	19	803	244	4,225	4·2	178·6	137·6
Nanango No. 1	20	759	238	3,838	4·3	163·6	130·0
Nanango No. 2	21	818	234	4,416	4·1	179·4	147·4
Nanango No. 3	20	702	246	4,531	3·9	178·0	159·7
Proston	22	753	230	3,528	4·4	154·0	135·4
Tansey	17	424	250	3,299	4·5	150·0	116·3
Wooroolin–Tingoora	22	699	235	4,145	4·1	168·9	129·3
South-East Queensland	*505*	*17,827*	*246*	*3,827*	*4·3*	*164·4*	*138·8*
Beaudesert No. 1	12	633	249	4,540	3·8	170·6	153·9
Beaudesert No. 2	9	441	236	4,079	3·8	156·4	125·4
Beechmont–Currumbin	20	819	244	3,422	4·3	147·1	132·8
Beenleigh	16	608	255	4,112	4·0	162·7	129·0
Boonah	29	890	248	4,469	4·3	190·7	163·9
Brisbane No. 1	28	577	263	4,910	3·9	189·4	153·5
Brisbane No. 2	20	811	248	3,966	3·8	150·7	134·9
Cedar Pocket	17	528	242	3,259	4·8	156·2	140·3
Cooroy	16	790	242	3,445	4·6	159·5	136·0
Esk No. 1	18	823	236	3,969	4·1	163·0	169·2
Esk No. 3	15	493	232	3,839	4·3	163·7	161·9
Gatton	19	464	223	3,739	3·9	145·8	124·5
Gympie No. 1	18	593	230	3,093	4·7	146·8	116·3
Gympie No. 2	15	789	238	3,343	4·9	150·4	140·5
Ipswich No. 1	16	307	256	3,999	4·2	169·6	130·6
Ipswich No. 2	19	523	253	4,476	4·1	183·6	138·2
Ipswich No. 3	18	519	242	4,513	3·9	176·8	154·3
Kenilworth	20	780	248	3,832	4·4	167·9	153·3
Kilcoy	24	1,233	244	3,329	4·5	148·4	129·2
Laidley	14	307	225	3,190	4·3	138·4	104·8
Lowood	16	468	250	4,201	4·2	178·1	137·6
Maleny No. 1	15	479	256	3,371	4·9	164·3	127·4
Maleny No. 2	15	428	263	3,540	4·8	170·7	138·9
Maleny No. 3	9	404	276	4,985	4·4	219·3	159·2
Maryborough	18	402	243	3,384	4·3	147·0	115·9
Merrimac–Mudgeeraba	14	660	254	4,362	4·1	177·2	144·7
Nambour	22	758	252	3,313	4·5	148·1	116·9
Pomona	16	615	251	3,661	4·8	174·8	135·5
Wolvi	17	685	236	3,377	4·7	160·1	125·2
Eastern Downs	*207*	*5,505*	*243*	*4,983*	*4·1*	*206·1*	*173·0*
Allora No. 1	15	332	239	4,723	4·1	191·7	160·9
Allora No. 2	18	386	259	5,595	4·1	227·8	194·2
Crow's Nest	25	673	240	4,110	4·3	176·0	139·2
Goombungee	18	602	241	4,461	4·3	191·8	164·6
Oakey	21	757	245	4,904	4·2	205·1	170·2
Pittsworth No. 1	21	565	241	5,436	4·1	220·6	195·2
Pittsworth No. 2	10	268	249	5,143	4·3	222·9	192·5
Toowoomba No. 1	25	582	244	5,464	4·1	224·2	191·4
Toowoomba No. 2	25	661	231	4,919	3·9	191·0	159·0
Warwick No. 1	16	407	244	5,322	4·1	218·7	174·1
Warwick No. 2	13	272	249	5,514	4·2	233·3	189·2
Western Downs	*81*	*3,082*	*233*	*4,404*	*4·1*	*179·8*	*143·6*
Chinchilla	15	518	242	4,657	4·1	192·9	142·2
Chinchilla–Wandoan	15	412	234	4,639	4·2	194·4	154·3
Dalby No. 1	17	469	238	4,598	4·0	184·3	149·5
Dalby No. 2	19	853	227	4,448	4·0	177·7	..
Jandowae	15	830	230	3,974	4·1	164·2	145·5
Queensland Figures	*1,259*	*43,412*	*243*	*4,022*	*4·2*	*170·0*	*142·5*

The groups are listed according to districts and the average production of each district is shown also.

It is interesting to note that the average yield per cow increased in all districts except in the North. On the Atherton Tableland the production decreased from 168 to 161 lb. fat and from 138 to 131 lb. at Mackay. This drop was due to the effect of winter dysentry, followed by an excessively wet season during the first six months of 1959.

Butterfat Ranges of Cows

The number of cows whose yields came within the various butterfat ranges is shown in Table 6.

TABLE 6

Range of Butterfat	Number of Cows	Percentage of Cows
Under 100 lb.	5,998	13·8
100–149 lb.	11,703	27·0
150–199 lb.	12,892	29·7
200–249 lb.	7,796	18·0
250–299 lb.	3,312	7·6
300–349 lb.	1,136	2·6
350–399 lb.	419	1·0
400 lb. and over	156	0·4

The percentage of cows which gave less than 100 lb. fat for a completed lactation decreased from 24·1 per cent. last year to 13·8 this year. This percentage is still too high. It means that one cow in every seven produced below 100 lb. fat.

The number of cows which yielded over 200 lb. fat increased from 15·5 to 29·6 per cent. or almost one cow out of every three.

Under Queensland conditions it is considered that 200 lb. fat should not be beyond the capacity of the average cow.

Production Ranges

Herds were grouped according to their butterfat production and the groupings for ranges of 50 lb. of butterfat are listed in Table 7.

TABLE 7

Butterfat Production Range	Number of Herds	Percentage of Herds
Under 100 lb.	98	7·7
100–149 lb.	393	31·2
150–199 lb.	477	37·9
200–249 lb.	200	15·9
250–299 lb.	66	5·2
Over 300 lb.	25	2·0

The percentage of herds averaging less than 100 lb. fat decreased from 18·2 to 7·7 per cent. However, it is still noted that 40 per cent. of the herds or two out of every five averaged under 150 lb. fat.; 23 per cent. averaged over 200 lb. fat compared with 11 per cent. of the previous year.

TABLE 8

HIGHEST HERDS 1958–59

Highest Herds	Group	Breed	Cows	Milk	Test	Fat	Days
11–20 cows							
L. G. Weier	Allora 1	AIS	13	10,209	3·5	358·4	274
A. Ruge and Sons	Biggenden	G	19	7,604	4·5	344·4	297
A. and D. Krautz	Toowoomba 2 . .	AIS	11	8,495	4·0	341·2	278
21–50 cows—							
J. H. Fletcher	Warwick 1	AIS	26	9,406	4·0	373·5	285
R. J. Knowles	Nanango 3	AIS	26	7,998	4·5	356·6	298
W. and E. Adlem	Kingaroy	Mixed	37	8,343	3·9	328·7	276
51–100 cows—							
J. McInnes	Durong–Wondai . .	AIS	78	8,841	3·9	342·0	279
W. Diill and Son	Boonah	AIS	55	8,309	3·7	308·2	279
E. and K. Rogers	Pittsworth 2	J	67	5,599	5·0	277·1	273
101 and over—							
G. E. Loader	Monto 1	J	104	4,560	5·2	237·4	250
P. F. H. O'Brien	Jandowae	J	164	3,655	4·9	178·2	246
Haselwood Bros.	Jandowae	AIS	122	4,555	3·7	170·0	233

Highest Producing Herds

The highest producing herds are listed in Table 8 in sections according to the number of cows which completed recorded lactations during the year.

These results show what can be achieved by careful planning and intelligent use of information provided by herd recording.

The highest average production was obtained by Mr. J. H. Fletcher whose herd of 26 cows averaged 9,406 lb. milk and 374 lb. fat. The average length of lactation was 285 days.

Mr. Fletcher commenced recording in 1955 and the average production for the herd since then has increased from 253 lb. of butterfat in 1955-56 to 374 lb. of butterfat in 1958-59. Complete details of the progress of herd recording in this herd are available in another article in this Journal.

* * *

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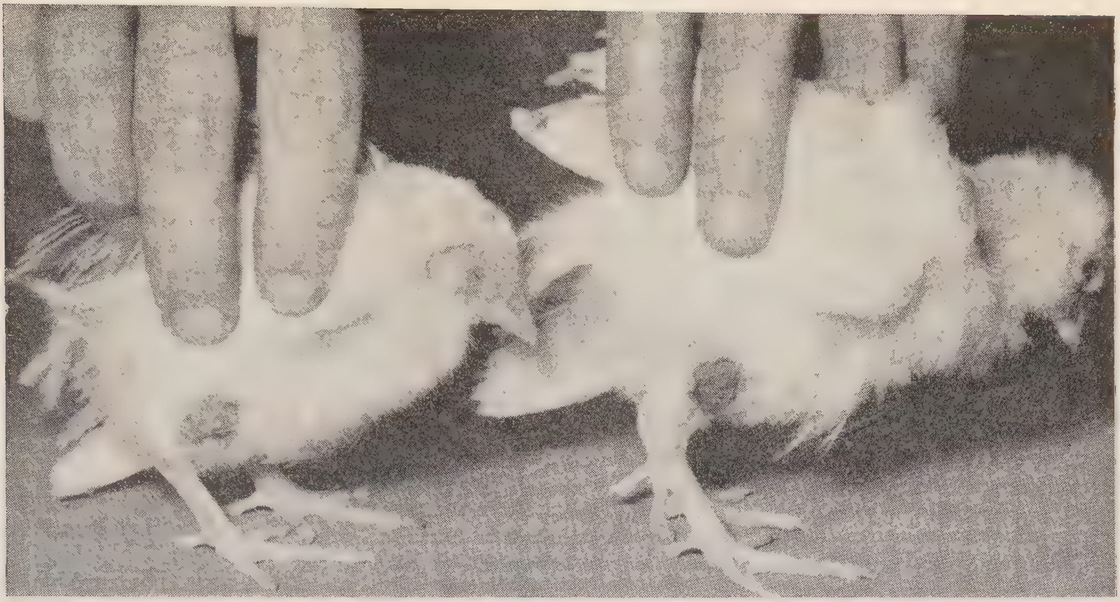


Plate 1

Wrong Vaccine Used on Day-Old Chicks

By **P. D. RANBY,** Veterinary Officer

The two chickens in Plate 1 are from a flock of 4 weeks old cockerels that have suffered a severe setback. Note the area of proud flesh on the leg of each bird, just above the hock joint. This area is where the chickens had been vaccinated.

The owner had vaccinated the 250 cross-bred chickens when they were one day old, using fowl pox vaccine. The follicle method had been employed. His mistake was that he had used the wrong vaccine.

He should have used pigeon pox instead of fowl pox vaccine.

Although fowl pox vaccine is suitable for older chickens (6 to 12 weeks), standard vaccine is too severe for baby chickens. Pigeon pox vaccine is safe to use at any age but the immunity is not so strong.

The owner reported that the first ill-effects occurred 2 to 3 weeks after vaccination. This would coincide with the expected time for the systemic (or general) reaction for fowl pox vaccine. After vaccination with fowl pox vaccine (follicle method), the local reaction is seen by the sixth day as swelling of the feather follicles, each follicle being "capped" with a scab. Normally, the follicle swellings subside between the second and third week after vaccination and the scab material is shed.

However, in the flock in question, the whole vaccinating area became swollen and the swelling persisted well after the usual time.

In the two to three weeks following the first signs of sickness, 80 chickens died. This represents a death-rate of 40 per cent.! The survivors gradually recovered but at 12 weeks of age some of the birds still required culling.

This outbreak emphasises the care needed in vaccinating baby chickens against fowl pox. For details of fowl pox vaccination, see an earlier article entitled "Protect Chickens and Poults Against Fowl Pox". (December, 1959, issue of this journal.) This article will later be available in pamphlet form.

Pigs Graze Irrigated Clover

By J. B. AITKEN, Pig Branch

Pigs on a property at Moura now enjoy high quality grazing throughout the year, no matter how dry the weather. A small area of irrigated clover has made this possible.

The property, on the edge of the Dawson River irrigation area, is owned by Messrs. L. and J. Shelton. During the past year they have been grazing 100 sows and their progeny on irrigated clover, with very little trouble from photosensitisation.

Officers of the Department of Agriculture and Stock first outlined a plan for the pastures. In June 1958 an area of 5 acres was sown with 4 lb. Ladino clover and 1 lb. ryegrass seed an acre. The area was divided into three paddocks.

Within four months, pigs were grazing on these pastures.

The clover has gradually suppressed the ryegrass, and it has now been decided to sow clover only in future plantings for pig pastures.

Since the pasture was established, it has regularly carried about 50 head of sheep, in addition to the pigs. During the dry weather last October, 80 porker-sized pigs grazed the pastures.

Self-Feeders

The pigs use the grazing run in a paddock of native forest grasses adjoining the irrigated area. In this paddock are shelters, self-feeders, and automatic waterers. The pigs have free access to whatever clover paddock is to be grazed by them. No shade is provided in the pasture paddocks.

Sheep are turned onto the paddock before it is opened to the pigs. Pigs apparently graze the pasture more evenly than the sheep, so they are used to graze each paddock to a close even sward before it is watered.

The first time pigs were turned onto the clover, the crop was lush and tall, and some damage was done where the pigs rooted and tore up small areas. Since then, nose rings have been used on the pigs and the pastures were fed off at an earlier stage of growth. Since these two practices were established there has been little damage to the pastures.

Watering is done every two weeks in summer, and every three weeks in winter. At watering time a paddock is closed to stock, given the amount of water considered necessary, and kept closed until it is ready for grazing, when stock are again given access to it.

White-skinned pigs grazing on pastures with a high percentage of clover are likely to show symptoms of photosensitisation. To date very little of this trouble has been experienced even though the pigs are all white-skinned.

The small area of irrigated grazing has proved of considerable value to the owners. It has been the source of a regular supply of vitamin A to the growing pigs, and has saved an appreciable amount of protein meal and grain. These pastures are rated so highly that it is intended to sow an additional 9 acres, so that the dry sows may also have the benefits of high quality grazing.

Not every pig farmer is able to provide irrigated grazing to this extent, but many are using irrigation for small areas of green feed. Today, when more pigs are being dry fed than previously, the value of an adequate supply of high quality green feed to provide vitamin A for health is enhanced.

This venture underlines what many farmers are discovering—that we are only beginning to realise the true value of a small irrigated area of green feed, whether it be grazed or cut and hand-fed.

Spraying Weeds In Pineapples

By R. C. CANNON, Senior Horticulturist

Here are ways to use chemical weedicides to control weeds in pineapples:

Chemical weedicides control weeds in pineapples more cheaply and more easily than hand chipping and are now used extensively. Pre-emergence spraying to kill weeds as they germinate is far more effective than trying to destroy them after they have become established.

Plate 1

A Weed-Free Crop of Pineapples at Montville Just Before Harvest.

Since 1949, Queensland pineapple growers have been using PCP (sodium pentachlorphenate) to keep their plantations free of weeds. A number of other weedicides have been tested and, of these, monuron (parachlorophenyl dimethylurea), formerly known as CMU, has proved superior to PCP in some respects. When they are properly used, both will control seedling weeds and many grasses without any injury to pineapples.

However, neither of them has any value against grasses such as couch or kikuyu, which spread by means of runners. Either TCA (sodium salt of trichloracetic acid) or dalapon (sodium salt of dichloropropionic acid) may be used to kill these types of grass, but only at the end of a crop cycle. They cannot be used in growing pineapples because of the risk of plant injury.

Pre-Emergence Control Best

There may be a certain amount of satisfaction in seeing a lot of dead weeds after you have sprayed, but experience has proved that pre-emergence spraying is more effective and more economical than post-emergence spraying. There are three good reasons why this is so:

(1) It is obviously better to destroy weeds before they have had a chance to compete with the pineapples for plant foods, moisture and sunlight.

(2) Pre-emergence sprays have a lasting effect, whereas spraying of large, established weeds does little or nothing to prevent another batch of weeds from coming up soon afterwards.

(3) Both PCP and monuron kill seedling weeds and grasses more easily in the their very early stages of growth.

Successful control of weeds depends on spraying before they have germinated, or just as the first weeds appear above-ground. The initial application for pineapples would automatically be made as soon as possible after planting and, preferably, after rain. This should keep the plantation free from weeds for 3 to 6 months, depending on the time of the year and the particular weedicide used. The second or any subsubsequent application should be made as soon as a few weeds start to appear. Weed control programmes often break down through failure to carry out follow-up operations at the right time.

If weeds do happen to get away from you, a contact spray may be necessary, but no time should be lost in destroying them while they are comparatively small. A mass of large, dead weeds forming a blanket over the surface of the ground will interfere with the penetration of the pre-emergence spray, which should be applied as soon as possible.

PCP Pre-Emergence Sprays

Sodium pentachlorphenate, used for PCP pre-emergence sprays, is available commercially as a powder (70 per cent. active ingredient), a paste (about 60 per cent. active ingredient) and a solution (50 per cent. active ingredient). These three forms are equally effective provided the sprays contain equal amounts of the active ingredient.

Sodium pentachlorphenate powder is very irritating to the nose and throat and all forms of PCP may be harmful if inhaled in quantity or absorbed through the skin. They should be handled with care.

Several deaths have occurred in Queensland through failure to take adequate safety precautions.

The PCP powder dissolves rather slowly in water and it is necessary to see that it is all properly dissolved before spraying. To avoid delays during spraying operations, it will be found convenient to make up in advance a stock solution containing 1 lb. PCP in 4 gal. water, to be diluted as required; the same applies to the paste. The solution can, of course, be quickly diluted with water for spraying.

For pre-emergence weed control, apply 10 lb. of the active ingredient to the acre in at least 200 gal. of water. The amount of water may be increased with advantage. There is no need to add a spreading agent to the solution, nor is agitation of the spray necessary, but ½ gal. of an oil emulsion may be added to the spray to reduce its irritating properties.

To be effective, PCP has to reach the zone where weed seeds are germinating (½ to 1 in. below the surface) and the best results are obtained when the soil is moist at the time of spraying or when rain falls immediately afterwards. If applied under very dry conditions or on a very sandy soil, PCP often gives poor weed control.

There is no need to take precautions against walking over the sprayed surface of the soil.

Monuron Pre-Emergence Sprays

Monuron is available commercially as a dispersible powder containing 80 per cent. active ingredient. It mixes readily with water but settles very quickly, and constant, vigorous agitation in the vat is necessary. It is relatively harmless to humans and no special precautions are necessary in handling it.

For pre-emergence weed control, 4 lb. of active ingredient in at least 200 gal. water are required to treat 1 acre. The amount of water may be increased without increasing the amount of active ingredient.

Like PCP, monuron must also reach the zone of weed seed germination and requires a moist soil to be effective. Unlike PCP, however, it may be applied to a dry soil even though it remains inactive until rain falls and raises the soil moisture. Monuron is absorbed through the root system of the plant, and young weeds which have already appeared above-ground die off in a few days.

Monuron remains effective in the soil for a longer period and kills young grasses rather more effectively than PCP.

PCP–Oil Contact Sprays

The addition of certain oils, such as diesel oil and creosote, greatly enhances the toxicity of PCP to established weeds. For high volume spraying, the oils must be in a form miscible with water. and emulsifiable diesel oils and emulsifiable creosote are available commercially for this purpose.

Combination sprays of this kind, containing 3 lb. of PCP and 1 gal. of an oil emulsion per 100 gal., give practically complete control of broad-leaved weeds. Grasses are more tolerant and sprays with even much higher concentrations of the ingredients are not entirely satisfactory for controlling them. Though frequently not killed outright, grasses are severely checked thereby giving the grower a respite during which they can be removed by chipping. Diesel oil is quite satisfactory in the PCP sprays used to destroy broad-leaved weeds, but creosote is slightly superior when grasses are troublesome.

Plate 2

Modern Methods of Weed Spraying in Pineapples at Woombye. Retractable spray hose used for applying weedicides in pineapples.

The best and cheapest way of preparing PCP-oil contact sprays is to use sodium pentachlorphenate and an emulsifiable oil. The oil is first emulsified in a small quantity of water and then added to the bulk of the water containing the requisite amount of PCP in solution. Commercial preparations containing pentachlorphenol (NOT sodium pentachlorphenate) dissolved directly in the emulsifiable oil are available and in common use. They are less economical, though easier to use, and are of less value for pre-emergence weed control than similar sprays containing PCP as sodium pentachlorphenate.

In applying a contact spray, it is essential to completely wet the foliage of the weeds. The quantity of spray required will, therefore, depend on the number and size of the weeds present.

TCA and Dalapon for Special Grasses

As mentioned, both TCA and dalapon are injurious to pineapples. However, they may at times have to be used to eradicate couch or kikuyu grass from pineapple plantations. Where a small patch of either grass is present in a young plantation, it may be expedient to sacrifice a few pineapple plants to stop it spreading. Normally, however, these weedicides should be used only during the inter-cycle period and a strenuous effort made to complete weed eradication some time before replanting.

TCA and dalapon give the best results if applied when the grasses are actively growing but several weeks may elapse before their effects are apparent. For a complete kill, up to 100 lb. of TCA or 40 lb. dalapon an acre are required. Land treated with dalapon may be replanted to pineapples within 6 to 8 weeks; after TCA treatment, replanting should be deferred for several months.

Pre-Emergence Spraying

The main point to be remembered in applying pre-emergence weedicides is that the material has to reach and enter the soil. It is not necessary to use high pressure equipment—a watering-can would be good enough if it were not so slow and laborious. When sprays are applied at high pressure, giving a very fine spray, much of the solution may blow away and not settle on the soil to be treated.

In farm practice, a pressure of 30 lb. per sq. in. is adequate and results in comparatively little wastage.

As already mentioned, a moist soil is preferred for weedicide spraying, and growers should take full advantage of weather conditions in timing their weed sprays. When re-spraying an area, it may pay to put the weedicide on a little earlier than is absolutely necessary if good rain has fallen and there is no immediate prospect of further rain.

The only precaution necessary in spraying pineapples with PCP is to direct the spray so as to avoid wetting the tender growing tissues at the bases of the leaves or in the hearts of the plant. However, it is usually safe to spray over the top of newly-planted pineapples, provided the spray is applied within a week or so of planting and before active growth commences. This gives a good coverage of the soil close to the plants.

Pre-emergence weed control in pineapples has proved highly successful in Queensland over the past 10 years and few, if any, growers would consider reverting to the chipping hoe. However, individual failures do occur. They can almost invariably be traced to one or other of the following causes:

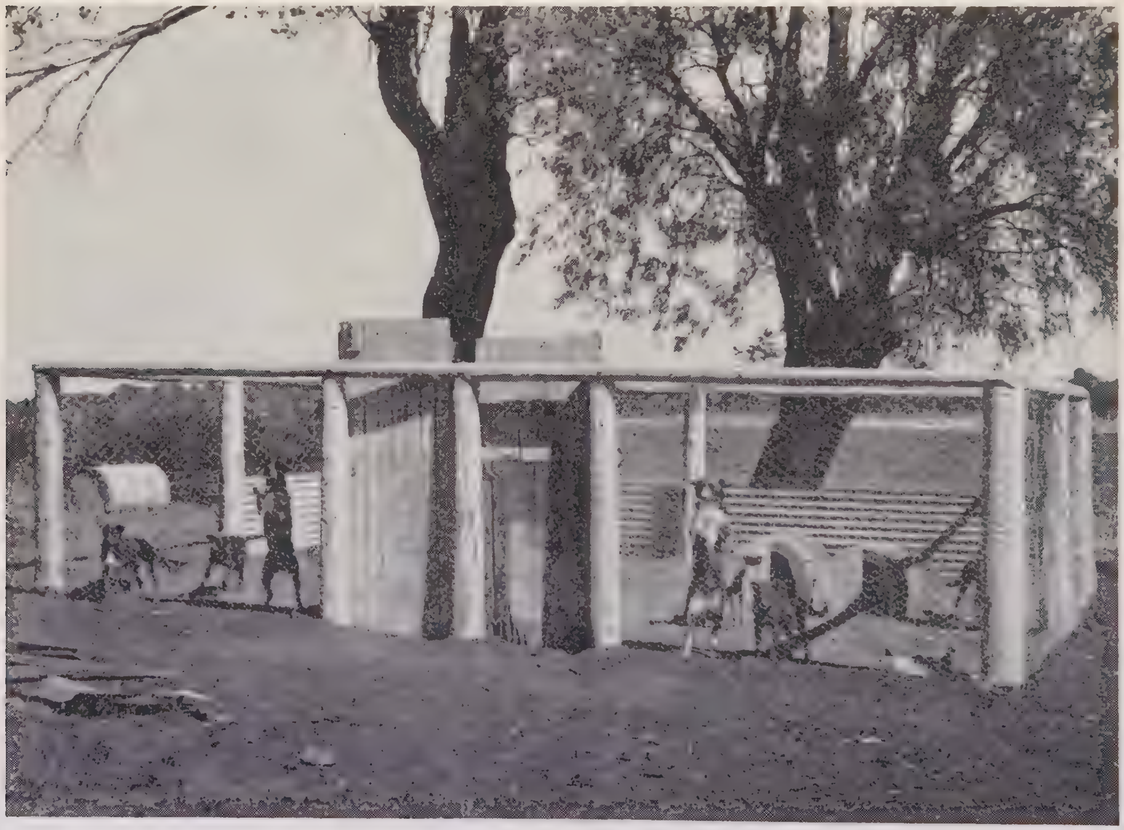
(1) Spray pressure too high, or nozzle too fine.

(2) Soil too dry.

(3) Weedicide not completely dissolved (in the case of PCP) or insufficiently agitated (in the case of monuron).

These are faults in procedure and can be easily rectified once the cause of failure is recognised.

In The Dog House



Dog Pens At North Bindango, Roma.

Stock and Station

Nitrite Poisoning Kills Quickly.—Nitrite poisoning will kill cattle, sheep and pigs very quickly. Once symptoms appear, you'll need to identify the condition immediately to have a chance of saving affected animals.

The clearest sign of nitrite poisoning is that the blood of an affected animal turns a chocolate colour. Look at the colour of the small blood vessels underneath the eyelids and around the eyeballs. These will be quite brown. Other symptoms in cattle and sheep are rapid breathing and twitching muscles. The inside of the mouth turns bluish. Pigs usually vomit, and squeal as though in pain.

Nitrite poisoning can be treated by injecting a weak solution of methylene blue into the bloodstream. But because of the skill needed to give the correct dose, treatment is best carried out by a veterinary surgeon or stock inspector.

—K. M. GRANT,
Assistant Director of Veterinary Services.

Control of Sheep Body Louse.—Many sheepmen, particularly those with small properties having rather limited improvements, have come to rely on strip jetting of sheep to control body louse. By jetting the sheep in strips along back and sides they hope to eradicate louse infestation altogether or at least reduce it to very low levels. Such technique is frequently carried out with small jetting plants, or even with knapsack sprays. Although on the face of it, the method appears economical because of the saving in expenditure on plant such as power sprays, plunge sprays, or portable spray dips, research investigation has demonstrated clearly that this form of louse control with some insecticides is unsatisfactory. Controlled experiments by the Pathology Branch of the Division of Animal Industry showed that jetting along the back with organic phosphate insecticides will not control lice infestation. The treated areas are lice free, but there is a rapid increase in lice population in the untreated areas, and the sheep reverts to the previous typical appearance of lice infestation.

—R. B. YOUNG,
Senior Adviser, Sheep and Wool Branch.

Using Gouge Dehorners on Calves.—The Agriculture Department recommends gouge or cup dehorners for dehorning calves from 3 to 9 months old. Used properly, the calf is completely polled, and the operation is simple and nearly painless.

Many dairy farmers will have calves at the right age for dehorning now and through the summer and autumn months.

To use gouge dehorners, place the instrument over the horn base and aim to remove about ¼ in. of skin along with the horn. With the dehorners in position and the calf restrained, remove the horn by quickly snapping the handles to the closed position. Stubs or scurs are usually caused by lifting the dehorners at the time of cutting. Avoid these by pressing the dehorners to the calf's head as the horn is about to be cut.

—W. F. MAWSON,
Senior Cattle Husbandry Adviser.

Poison Plants Are Sly Killers.—Each year, more stock in Queensland are killed by poison plants than most farmers and graziers realise. Large numbers of animals are affected only occasionally, and usually only an odd beast dies now and then for no apparent reason. Over the whole State, this constant wastage adds up to a heavy toll in 12 months.

It's often very difficult to confirm a suspicion that plant poisoning has caused an animal's death. This is because most poison plants produce no definite symptoms.

Most paddocks contain plants capable of causing death if eaten in sufficiently large quantities. If you suspect plant poisoning, send specimens of the suspicious plants with your other specimens to the Animal Research Institute, Yeerongpilly. Knowing the plants growing in your paddocks will help the Botanist in his examination of the stomach contents of freshly dead beasts.

—B. PARKINSON,
Divisional Veterinary Officer.

Profitable Pigs.—Very young pigs need far more protection from cold and wind than market pigs or breeders. In winter the litters that are kept warm and comfortable are the ones that will be profitable to you later on.

Litters which are farrowed in cold pens are often chilled at birth, and seldom recover. Many of these chilled pigs die within the first few days; the remainder may survive up to porker or baconer weights. These survivors are seldom economic owing to the extra time and feed required.

For successful litter rearing you need a warm dry shed, free from draughts. Now is the time to check all your pig sheds. Make sure they won't be a source of loss through slow growth and disease in your pigs this winter.

Check floors, walls, and roof. The floor must be warm, dry and free from draughts. Walls and roof should be capable of keeping out wind and rain.

Grade your sheds, and put your youngest pigs in the warmest ones, ending up with the oldest stock in the poorer sheds. The alternative is to make all sheds warm for winter, and have specially fitted sheds for litter rearing. Money spent on this work would be a wise and profitable investment.

—*T. ABEL, Senior Adviser, Pig Branch.*

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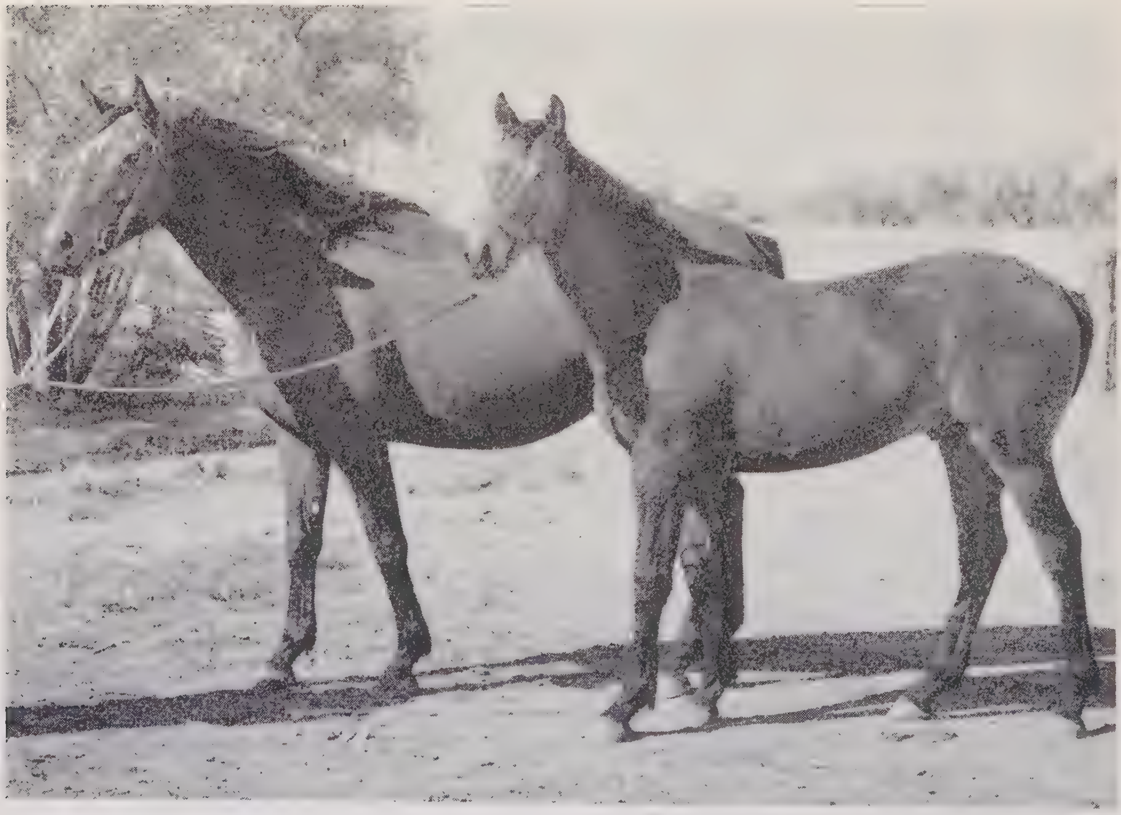
A Family Likeness



Blood Mare and Foal at Whynot, Quilpie.

The Fight Against Disease—VII.

Transmission Of Disease From Animals To Man

By C. G. LUDFORD, Bacteriologist

Besides stockowners, the whole public benefits from the work carried out by veterinary microbiological laboratories on diseases of animals.

Everybody knows that certain human diseases are spread from one infected person to another, for example a child with mumps is kept isolated not only so that he may be nursed to recovery but that he may not spread the disease to his friends.

The disease mumps is said to be host specific: it spreads only from human to human, and there is no fear of the little patient's pet puppy having mumps too. Conversely a child cannot catch mumps from a puppy or any other animal.

However, there are some diseases that are able to spread from animals to man. These are known as zoonoses, the word being coined from the Greek *zoon,* an animal and *nosos,* sickness. An example is psittacosis or parrot disease, where man is infected from sick or infected parrots.

It is important that the veterinary microbiology laboratory be able to recognise such diseases in animals and to help accumulate knowledge of the areas where they occur. Not until then can eradication of the disease be successful.

This brings the veterinary laboratory into the field of public health.

Australia is fortunate in escaping many severe diseases of animals that occur in other parts of the world, particularly in such continents as Africa where there is a large wild animal population to act as a reservoir of infection. The constant watch of the quarantine authorities is responsible for these diseases being kept out.

Even so, a surprising number of diseases occur here that under suitable circumstances may infect man.

Spread by Four Ways

The third article of this series explained how infectious diseases may be spread in four different ways. The first is by direct contact with an infected animal, the second by contact with the microorganism in the external environment, the third by introduction of the microorganism into the animal and the fourth by transmission by an insect vector (or carrier).

Although a disease is not necessarily restricted to a single means of spread, one pathway is usually the major method and only occasional infections arise via alternative ways. Therefore, it is convenient to classify the zoonoses according to this same scheme:

1. *Diseases spread to man by direct contact with infected animals.*—It was observed that this pathway is exceptional in the transmission of infection between animals, other than in the venereal diseases. However, certain sections of human populations such as stockowners, employees of slaughter yards and veterinarians may be in direct contact with animals and so are exposed to infection.

On the other hand, inhabitants of cities are not usually in contact with animals and are not infected in this way. An example is brucellosis, a disease nearly restricted to people handling animals.

It is interesting to note that when a case does occur in an urban dweller, his infection may often be traced to a recent farm holiday.

Other diseases spread to man by direct contact are shown in the first part of Table 1. Some of these such as erysipelas, listeriosis, and melioidosis are very rare in man and so there has not been much opportunity to study the ways in which man is infected. Vibriosis is included in this group although it is not fully understood how man becomes infected. The infection has been known for many years in cattle, but only recently has it been suspected in man. In this group, ringworm is the only disease likely to infect any member of the population, as the cat may pass infection to man.

2A. *Diseases spread to man by external contact with the pathogen.*—One important disease, leptospirosis, is transmitted in this way, and there are two others, anthrax and Q fever, that are of minor importance.

Leptospirosis is very widespread in Queensland among cattle and pigs. Two factors make this disease readily transmissible to man. Firstly, infected animals exrete the causative organisms in the urine, and secondly, the organisms may pass through intact skin to infect man. As they may live at least for some days in surface water, it can be seen that persons who are splashed with contaminated urine or water may become infected. Of course, the disease may be passed to stock in the same way.

Leptospirosis also occurs in North Queensland in rats and in some small native animals. Infected animals may contaminate small streams and surface water with their urine, and so spread the disease to man.

Anthrax and Q fever may infect handlers of hides and skins that contain the organisms. Anthrax has also been known to occur in man following the use of toilet goods such as new shaving brushes made from bristle infected with the resistant spores of the organism. Now all such material must be sterilized in steam before it is made into articles for human use.

2B. *Diseases spread to man by introduction of the pathogen into the body.*—A number of diseases may be spread in this way as well as by direct contact with the infected animal. In recent years there has been a lot of attention drawn to salmonellosis in both domestic and wild animals. Losses of animals have been of great economic importance, and in addition, the animals have formed a vast reservoir for infection of man. Salmonellosis, or food poisoning, or gastro-enteritis as it is commonly known, may spread from person to person as well as from animal to person. However, outbreaks occur from eating of infected foods such as eggs, meat—in types of sausages that are inadequately cooked—and sometimes milk.

Under conditions of bad hygiene, rats or mice may contaminate stored food that is later eaten without being cooked.

Salmonellosis is also a disease that may travel in the reverse to what has already been described, from man to animals. Human carriers of the disease in addition to spreading infection to other persons may initiate an outbreak in livestock.

Rats and mice may also be infected from excreta of persons with salmonellosis and then play their part in infecting other persons.

Several milk-borne diseases fall into this group, but are less important now than formerly as nearly all city milk is pasteurised to destroy pathogenic bacteria. Brucellosis, Q fever, bovine-type tuberculosis and possibly vibriosis are examples.

Bovine-type tuberculosis may infect lymph glands of children and should be distinguished from the more common human type or pulmonary tuberculosis, which is transmitted from man to man and rarely from animals to man.

The organisms of two diseases in this group may infect man through inhalation of infected dust. Q fever occurs in sheep, cattle and goats, although it does not seem to produce visible symptoms in affected animals. The organisms may be excreted by parturient animals in enormous numbers along with the placenta or afterbirth. If such material is allowed to remain in a paddock the organisms readily become mixed with dust and so may be re-deposited onto the fleece or coat of other animals. Persons handling these animals may breathe infected dust and so contract the disease.

Psittacosis may infect man by inhalation of faecal dust from affected birds, as already mentioned.

Tetanus, the remaining member of this group, is only indirectly transmitted by animals. The organism is a normal inhabitant in the intestinal tract of animals, and enters the soil in faecal droppings. Man is usually infected by the presence of the organism on objects causing puncture wounds. Tetanus is commoner in Queensland than in other Australian States, probably because the climate is more favourable to going barefooted.

3. *The transmission of disease from animals to man by an insect vector.*—Australia is fortunate that few diseases are transmitted in this way. In other parts of the world the number is much greater. Q fever, in addition to the routes of infection already described, may pass to man through the bite of an infected scrub tick (*Ixodes holocyclus*). The ticks are described as vectors or carriers, and become infected when biting another animal. In Queensland this is usually the bandicoot, or possibly other small native marsupials.

Queensland tick typhus is a mild disease also transmitted by tick bite and again small native animals provide a reservoir of infection.

During 1951 an outbreak of human disease occurred in the Murray River region of New South Wales and Victoria and was subsequently called Murray Valley encephalitis. It was characterised by inflammation of the brain of the sick persons, frequently resulting in death or permanent disability.

Investigation showed the disease was caused by a virus and was transmitted by certain mosquitoes.

Fortunately there have been no further outbreaks but workers have found that the disease was introduced by migrating water birds. Although affected birds were not sick, they carried the virus in their bloodstream; mosquitoes biting them became infected and were capable of carrying the disease to other birds, or to man. Domestic fowls could also be infected and presumably play a part in the transmission of the virus.

TABLE 1

Some Diseases of Animals Transmissible to Man

—	Disease	Animal
Group 1 . .	scabby mouth	sheep
	erysipelas	pigs, sheep
	listeriosis	sheep
	brucellosis	cattle, pigs
	? vibriosis	cattle
	ringworm	cattle, cats, dogs
	melioidosis	sheep, pigs, goats
	anthrax	most animals
	Q fever	sheep, cattle, goats
Group 2A . .	anthrax	most animals
	leptospirosis	cattle, pigs, rats, native animals
	Q fever	sheep
Group 2B . .	tetanus	
	psittacosis	birds
	tuberculosis	cattle
	brucellosis	cattle
	vibriosis	cattle
	Q fever	cattle
	salmonellosis	most animals and birds
Group 3 . .	Q fever	native animals
	Queensland tick typhus	native animals
	Murray Valley encephalitis	birds

Prevention

Animal quarantine regulations play an important part in the control of the zoonoses. Diseases not occurring in Australia may be kept out by prohibiting or restricting the import of certain animals. For example, rabies, a disease passing from dog to man, is prevented from entering Australia by banning importation of dogs from areas where the disease occurs.

Where disease is already established in Australia, there are several ways to limit infection in animals and to prevent infection of man. The disease may be controlled or limited in its animal host, animal products may be sterilized before human use, and man may be immunised to minimise the risk of his infection.

The most obvious approach is elimination of the disease in susceptible animals. As an extreme measure, affected animals may be slaughtered, a procedure that has no counterpart in human medicine. A good example is the success in some countries of the test and slaughter programme for the elimination of bovine tuberculosis. A notable decline in the number of reactions has occurred and control of the disease by this means is possible, much sooner than pulmonary tuberculosis can be eliminated in man.

On the other hand, eradication of a disease with a reservoir of infection in wild animals or birds is much more difficult. Here, control of vectors passing the disease to man must be attempted and if possible persons at risk may be immunised.

Immunisation is also very important in the prevention of tetanus in man. It is done by injections of toxoid and gives immunity for several years. Such immunisation should be distinguished from the temporary protection lasting only a few weeks given by an injection of antiserum. Tetanus antiserum is only used following a puncture wound in a person who has not been immunised with toxoid.

In certain diseases where infection in animals may be difficult to detect, man may be effectively protected by breaking a link in the chain of circumstances leading to his contact with the organism. For example, the pasteurisation of egg products destroys bacteria of the genus *Salmonella* that may be present. However, such methods of control should only be temporary measures; for the pool of infection still remains in the host animal, where it continues to cause economic losses.

With disease control, one most important factor is the co-operation of animal owners, for without this, no programme can be effective. The prevention and control of all animal diseases is first and foremost of greatest benefit to the stockowner, not only for public health reasons but for his own financial gain.

(Concluded)

Junior Farmers at Gatton

Junior Farmers Visiting the Queensland Agricultural High School and College at Lawes Have a Close Look at Pasture Grasses and Clovers from the College's Irrigated Pastures.

Removing Honeycombs From The Hive

By C. ROFF, Adviser in Apiculture

Apiarists have a choice of three methods commonly used for removing honeycombs from the beehive. These methods are described:

Shake and Brush

Honeycombs ready for extraction may be removed from the colony by a slight upward movement of the frame, followed by a quick reversal and downward shake to dislodge most of the bees; the remaining bees then are brushed off with a specially designed bee-brush. Frames free of bees are placed in empty supers on a barrow, and when sufficient have been removed are taken to the honeyhouse for extraction.

Carbolic Acid Gas

An efficient method using carbolic acid for removal of complete supers containing 8 or 9 honeycombs has been adopted by Queensland commercial apiarists to avoid separate handling of each frame. In this method the cover of the hive is replaced by an "acid board" impregnated with carbolic acid. Heat from the colony and the sun volatilises the acid and the resultant vapour forces bees to leave the super immediately beneath the acid board.

Acid boards are made from flat galvanised iron painted black to improve solar heat absorption and are cut to fit light wooden rims the size of the tops of hives. Absorbent material such as light towelling is fastened on the underside for impregnation with liquid carbolic acid. The towelling is stretched and tacked to the wooden frames, so as to allow for a space of ¾ in. above the top bars of the honeycombs. As most fabrics sag, strands of case wire or wire-netting may be used to support the towelling. The completed acid boards must fit snugly on the tops of the hives.

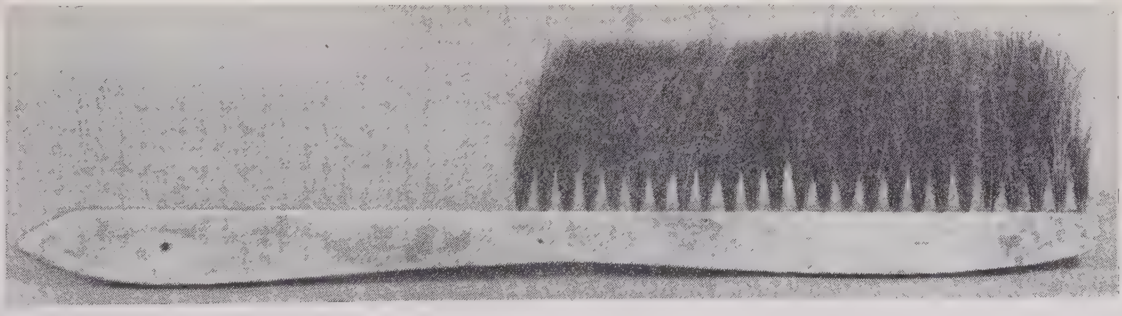


Plate 1

Bee Brush.

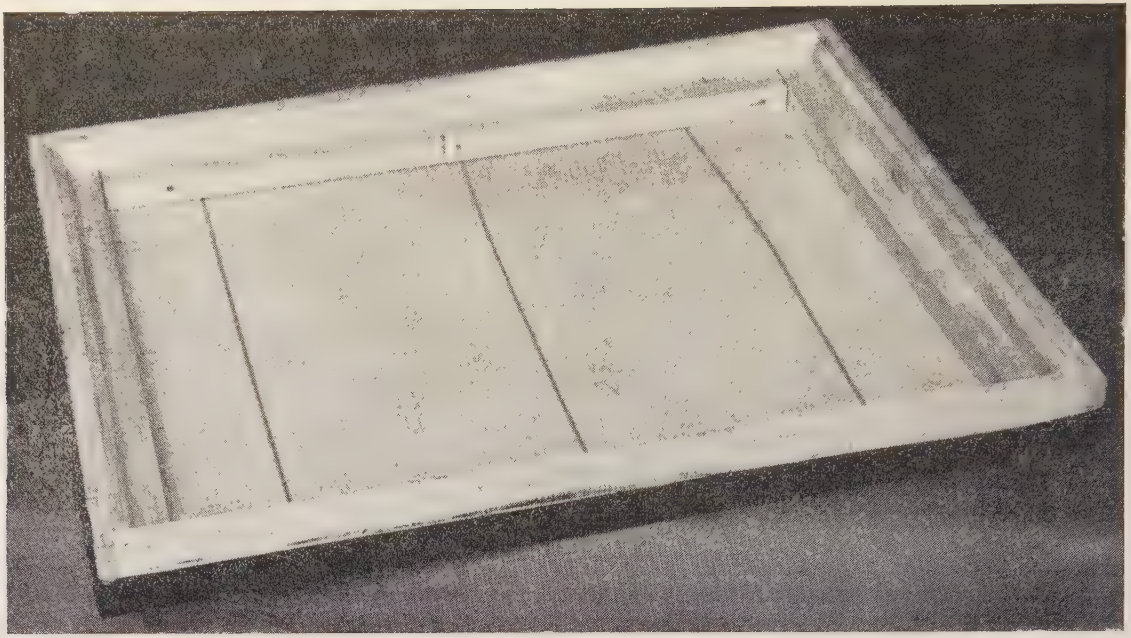


Plate 2

Carbolic Acid Board.

Liquid carbolic acid is prepared by dissolving carbolic acid crystals (phenol, B.P. standard) in four parts by volume of water. Gentle heating on a waterbath will hasten solution. *Remember carbolic acid must be handled carefully as it is strongly corrosive and severely burns human skin. Remedial measures are methylated spirits applied immediately, or thorough washing with soap and water.*

The acid boards are prepared for use by shaking liquid carbolic acid onto the towelling from a bottle fitted with a household laundry clothes sprinkler. The towelling must be wetted thoroughly but the acid must not drip onto the honeycombs as tainting will occur. Tainting has not been caused by carbolic acid as a vapour.

When ready for use, acid boards are placed with the cloth side down over hives from which the covers have been removed. Under summer conditions, the bees leave the honey supers immediately beneath in about 5 min., after which the top super can be removed and the acid board placed over the next super of the colony or onto another hive. In summer during cool weather or when the sun is clouded, acid boards work slowly but effectively; in winter, however, unless warm weather prevails, this method is unsatisfactory.

The number of acid boards in use at any one time depends on the rapidity with which the bees are repelled; in large apiaries 5 to 10 boards may be found satisfactory. The number used should be sufficient to allow the operator to take away honey supers in a steady flow. The boards, however, should not be left in position too long as the bees may then leave the hives and crowd the entrances. Under such circumstances, or if the bees fly in abnormal numbers, the boards must be removed immediately. Once disturbed flight is excessive, bees of different colonies unite in the air, queenbees leave the hives and are lost, and drifting becomes general.

Bees do not move readily from brood combs, and the use of queen excluders to keep the broodnest in the bottom super, facilitates the removal of honeycombs with carbolic acid.

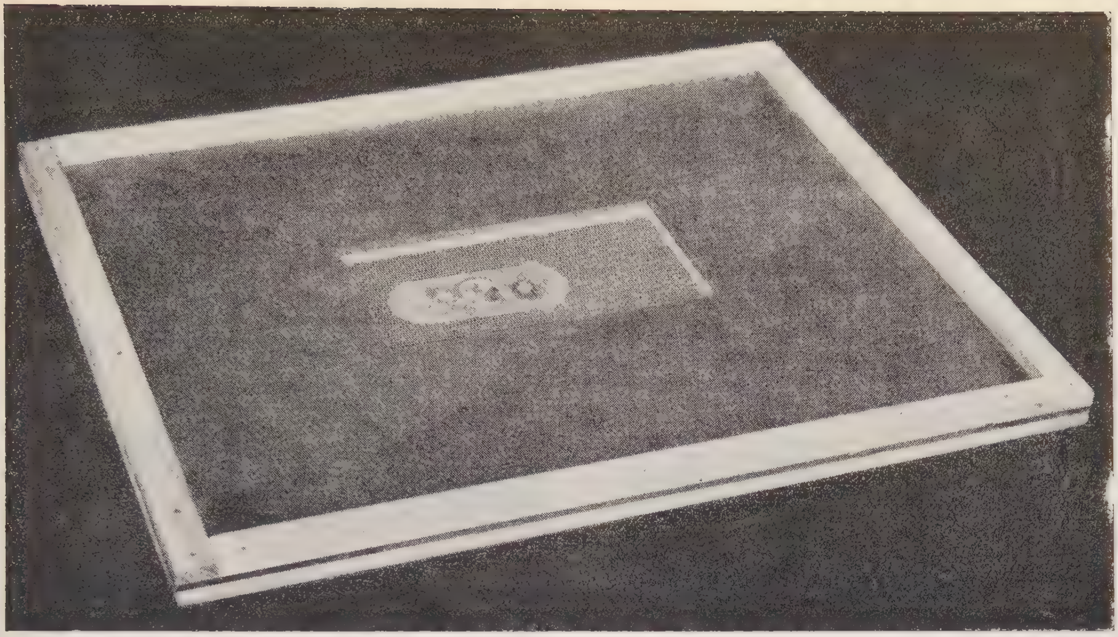


Plate 3

Clearer Board.

Clearer Board

Clearer boards exclude bees from honey supers and when a board is used in each hive, mass removal of honeycombs can be effected quickly.

The usual practice is to make clearer boards from water-resistant woodply or hardboard cut to the size of the tops of hives. A bee escape set in wire gauze is located in the centre of each board and narrow external wood rims are fitted. The escapes allow bees to move downwards, but prevent return.

During mid-afternoon, clearer boards are placed in the colonies between the brood-nests and supers. The following morning most of the bees are below the clearer boards and the supers can be removed. Occasionally it may be necessary to shake a few remaining bees from the honeycombs.

During hot weather the boards must not be left in place for longer than necessary as the absence of bees in the supers disrupts normal controlled hive temperatures resulting in the collapse and melting of honeycombs.

Keep Milk Free From Sediment

Beat the dust problem and you've taken a big step towards keeping your dairy produce free from sediment. Sediment is often a serious defect in milk and sometimes leads to its rejection at the factory. The sediment usually found in milk consists of dust and cow hairs. You can keep down the dust nuisance by providing concrete holding yards and races. Manure should be removed after each milking and heaped at least 150 ft. from the milking shed. A 30 ft. stock-free area should be enclosed around the milk room. Washing the udder before milking removes dirt and loose hairs that might otherwise be drawn into the milk. Use of cotton wool filter wads in the milk strainer will remove much of the sediment. But by then it may have introduced bacteria into the milk. It's safer to keep the sediment out.

—*L. T. FOSSEY, Dairy Officer.*

Tuberculosis-Free Cattle Herds

(As at 1st March, 1960)

Aberdeen Angus

Crothers, G. H. & H. J., "Moorenbah", Dirranbandi
Elliott, A. G., "Ooraine", Dirranbandi
Mayne, W. H. C., "Gibraltar", Texas

A.I.S.

Cox, T. L. & L. M. J., Seafield Farm, Wallumbilla
Crookey, J., Arolla A.I.S. Stud, Fairview, Allora
Davis, W. D., "Wamba", Chinchilla
Dennis, L. R., Diamondvale A.I.S. Stud, Mundubbera
Edwards Bros., "Spring Valley" A.I.S. Stud, Kingaroy
Evans, E. G., Lauraven A.I.S. Stud, Maleny
Green, D. B., Deloraine A.I.S. Stud, Fairdale
Heading, C. A., "Wilga Plains", Maleny
Henry, Mrs. K., Greenmount
Henschell, W., "Yarranvale", Yarranlea
H. M. State Farm, Numinbah
Littleton, H. V., "Wongalea", Hillview, Crow's Nest
Marquardt, A. C. & C. R., "Cedar Valley", Wondai
Mears, G. S. & E., "Morden", M. S. 755 Toogoolawah
Moore, S. R., "Sunnyside", West Wooroolin
Neale, D. G., "Groveley", Greenmount
O'Sullivan, Con., "Navillus", Greenmount
Phillips, J. & Sons, "Sunny View", Benair, Kingaroy
Power, M. F., "Barfield", Kapaldo
Queensland Agricultural High School & College, Lawes
Radel, R. R. & Sons, "Happy Valley", Coalstoun Lakes
Roche, C. K., Freestone, Warwick
Sanderson, W. H., "Sunlit Farm," Mulgildie
Schloss, C. J., "Shady Glen", Rocky Ck., Yarraman
Scott, M. E. & E., "Wattlebrae" A.I.S. Stud, Kingaroy
Scott, W. & A. G., "Walena" A.I.S. Stud, Blackbutt
Shelton, R. A. & N. K., "Vuegon" A.I.S. Stud, Hivesville, Murgon
Sokoll, A. H., "Sunny Crest", Wondai
Sperling, G., "Kooravale", Kooralgin, Cooyar
Sullivan Bros., "Valera", Pittsworth
Sullivan, D., "Bantry", Pittsworth
Sullivan, F. B., "Fermanagh", Pittsworth
Thompson, W. H., "Alfavale", Nanango
Webster, A. H., "Millievale", Sabine, via Oakey
Wieland, A. W., "Milhaven", A.I.S. Stud, Milford, via Boonah

Ayrshire

Dudgeon, C. E. R., Marionville Ayrshire Stud, Landsborough
Dunn, T. F., "Alanbank", Gleneagle
Goddard, B., Inverell, Mt. Tyson, via Oakey
Holmes, L., "Benbecula", Yarranlea
Mathie, E. & Son, "Ainslie", Maleny
Scott, J. N., "Auchen Eden", Camp Mountain
Zerner, G. F. H., "Pineville", Pie Creek, Box 5, Post Office, Gympie

Friesian

Behrendorff, E. C., Inavale Friesian Stud, M.S. 786, Boonah
Macdonald, S. E. G., "Freshfields", Marburg
Naumann, C. H., "Yarrabine", Yarraman
Pender, D. J., Lytton Road, Lindum
Stumer, A. O., Brigalow, Boonah

Guernsey

Doss, W. H., Degilbo, via Biggenden
Fletcher, A. B., "Cossart Vale", Boonah
Holmes, C. D. (owner Holmes L. L.), "Springview", Yarraman
Johnson, G. L., "Old Cannindah", Monto
Miller, G., "Armagh Guernsey Stud", Armagh, M.S. 428, Grantham
Ruge, A. & Sons, "Woowoonga", via Biggenden
Sanderson, N. H., "Glen Valley", Monto
Scott, C., "Coralgrae", Din Din Rd., Nanango
Swendson, A. C., Coolabunia, Box 26, Kingaroy
Wissemann, R. J., "Robnea", Headington Hill, Clifton

Jersey

Beckingham, C., Trout's Rd., Everton Park
Birt, W. C. M., Pine Hill Jersey Stud, Gundiah
Borchert, Mrs. I. L. M., "Willowbank" Jersey Stud, Kingaroy
Burrows, R. N., Box 23, Wondai
Bygrave, P. J. L., The Craigan Farm, Aspley
Carpenter, J. W., Flagstone Ck., Helidon
Conochie, W. S. & Sons, "Brookland", Sherwood Rd., Sherwood
Crawford, R. J., Inverlaw, Kingaroy
Farm Home For Boys, Westbrook
Fowler, P. & Sons, "Northlea", Coalstoun Lakes
Harley, G., "Hopewell", M.S. 189, Kingaroy
H.M. State Farm, Palen Creek
Hutton, D. R., "Bellgrath", Cunningham, via Warwick
Johnson, H. G., Windsor Jersey Stud, Beaudesert
Lau, J. F., "Rosallen", Goombungee, Toowoomba
Matthews, E. A., "Yarradale", Yarraman
McCarthy, J. S., "Glen Erin", Greenmount, Toowoomba
Meier, L. E., "Ardath Stud", Boonah
Noone, A. M. & L. J., "Winbirra", Mt. Esk Pocket
Porter, F., Conondale
Q.A.H.S. & College, Lawes
Ralph, G. H., "Ryecome", Ravensbourne
Scott, Est. J. A., "Kiaora", Manumbar Rd., Nanango
Semgreen, A. L., "Tecoma", Coolabunia
Seymour, B. T., "Upwell" Jersey Stud, Mulgildie
Smith, J. A. & E. E., "Heatherlea" Jersey Stud, Chinchilla
Tatnell, W. T., Cedar Pocket, via Gympie
Toowoomba Mental Hospital, Willowburn
Verrall, F. W., "Coleburn", Walloon
Weldon Brothers, "Gleneden" Jersey Stud, Upper Yarraman

Poll Hereford

Anderson, J. H. & Sons, "Inverary", Yandilla
Hutton, D. R. & M. E., "Bellgrath", Cunningham, via Warwick
Maller, W., "Bore View", Pickanjinnie
Maller, W., "Bore View", Gowrie Junction
McCamley, E. W. G., "Eulogie Park", Dululu
Wilson & McDouall, Calliope Station, Calliope

Poll Shorthorn

Leonard, W. & Sons, Welltown, Goondiwindi

Dealing With Seasonal Decline In Milk On Atherton Tableland

By **LORNA G. LIGHTBODY,**
Dairy Technologist, and
A. J. W. MURRAY,
Senior Dairy Adviser

The seasonal decline in milk composition and production on the Atherton Tableland is due to the low nutritional level of pastures in the dry period of the year. Additional fodder must be provided at this period. The results obtained with two commercial herds show how the problem can be solved successfully.

IT has been frequently pointed out that there is a characteristic seasonal decline in milk composition in dairying districts of Queensland, coinciding with a fall in the nutritive value of pastures. On the Atherton Tableland, the period when pastures are at their poorest is during the months of September, October, and November. The condition of pastures in the dry season becomes steadily worse until the summer rains begin in December or January.

During this dry season, the bulk milk supply from many farms contains less than the legal minimum of 3.3 per cent. fat. The fact that the factories on the Tableland introduced the policy of penalising suppliers whose milk did not conform to this standard brought the problem before the farmers. In addition, milk production at this time is low, and factories find it hard to get sufficient supplies for market needs.

Results from Five Farms

To get some detailed figures of these trends, sampling of milk from five selected farms in the Malanda district has been carried out regularly. The results obtained have been considered in relation to grazing and feeding practices on the farms.

The samples taken were from a mixture of the night's and morning's milk supply from each farm. Thus a sample of the 24-hour production from each herd was obtained. These samples were tested in the Dairy Research Laboratory for fat and solids-not-fat percentages.

The farmers taking part in the survey have co-operated by providing detailed information of pastures grazed, the condition of pastures, supplementary feeding, and the number of cows being milked. All the herds sampled were of A.I.S. cows.

Plate 1

First Year Guinea Grass on New Scrub Burn, Malanda Area. A man is wearing that hat.

Feeding Practices

The feeding practices on these five commercial dairy farms will be discussed. Three of these farms rely on natural grasses only, although on one farm, pastures have been improved by fertilizer treatment. The other two farms have small areas of irrigated pastures, and have used other supplementary feeding during the dry season.

Farm A has pastures consisting mainly of molasses grass with a smaller area of paspalum. A few acres along the creek flat are irrigated during the dry season. These pastures comprise guinea, green panic and elephant grasses, with a small area of para grass. The green panic and guinea grass pastures are grown in association with *glycine javanica* and centro legumes.

A glycine seed multiplication plot is established to provide supplies of this legume seed for sowing with improved pastures under irrigation.

The total acreage under irrigation is 6 acres. The irrigated pasture on this farm was top-dressed with sulphate of ammonia at the beginning of September and irrigation commenced from this time. The first grazing of these areas was at the beginning of October.

The irrigated pastures are strip-grazed, using an electric fence. About $\frac{1}{3}$ acre is grazed each night by the herd of approximately 30 cows. Irrigated pastures were found to be really effective for only 3 months with the one application of sulphate of ammonia.

A small area of oats and field pea was strip-grazed in July and August. In this case the herd was confined to $\frac{1}{2}$ acre each night. At the first grazing, the cows scarcely touched the field pea, but at later grazings the pea was eaten to the ground.

In 1958, before the irrigated pastures were used, maize offal was bought and fed to the herd. This purchased fodder was relatively expensive, and the same result could be obtained by having silage available to supply some additional feeding in the winter before irrigated pastures are used.

Farm B has pastures mainly of paspalum but some paddocks contain molasses grass, kikuyu, green panic and guinea. Paddocks which were noticed by the farmer to be particularly good contained mixtures of kikuyu, molasses grass and green panic. A small area of approximately 10 acres on this farm is also put under irrigation during the dry season, and these paddocks contained green panic and sweet sudan.

On this farm, the irrigated pasture has been grazed from August to December, but only for one or two hours each day. The areas have been strip-grazed.

As additional feeding from August to December, herd B received hammermill corn at the rate of 2 lb. a cow a day. This corn was grown on the farm and no fodder was bought.

Farm C is in an area where soil and climatic conditions are similar to those on farms A and B. The herd on this farm is grazed on natural pastures only. These comprise mainly paspalum and narrow-leafed carpet grass (*axonopus affinis*). On the river flats, there are small amounts of clover and para grass.

No supplementary feeding was given to the cows, with the exception of a short period from the third week in November. At this time, lucerne hay, which had been railed to the Tableland from the south was fed for four weeks. The consumption rate was 4½ lb. a cow a day. For two weeks at the end of November, maize meal was fed at the rate of 3 lb. a cow a day.

Farms D and E are situated in an area where rainfall is higher than in the case of the three previous farms. The pastures on farm D are mainly kikuyu and some paspalum and sour grass (*paspalum conjugatum*). In addition, two paddocks contain about 50 per cent. molasses grass.

The paddocks used mainly for the milking cows have been top-dressed regularly throughout the past two years with superphosphate, muriate of potash and lime.

Farm E has pastures composed mainly of paspalum and kikuyu mixtures with some sour grass and narrow-leafed carpet grass.

During the months of August to November, a small area of elephant grass was cut and fed to the cows after chaffing.

In the middle of November, lucerne hay similar to that fed on Farm C was bought. This additional fodder was used until the end of December.

Milk Composition

The monthly averages of fat tests on all samples taken during the year March, 1958, to February, 1959, were recorded. For purposes of comparison the average results of tests on samples of pasteurised milk from Malanda factory were also taken. These results are the averages of tests on about 24 samples monthly and therefore give an indication of the average fat percentage of milk supplies throughout the district.

It was shown that the fat percentage of the bulk milk is about 4.0 or higher till June, but after this time the level falls gradually to 3.6 in October to December. In January the test rises again to 3.9.

A similar trend is seen in the results from individual farms. However, in the case of herds C, D and E, the fat percentages are lower in the latter part of the year. Several results from these herds were below the legal standard of 3.3, and the average fat percentages for herd C in November, and herd E in November and December were below this standard.

The results for herds A and B remained above the standard for the whole year. Before the introduction of better feeding practices, mainly achieved by the use of irrigation on improved pasture species, considerable difficulty was experienced regularly in maintaining the fat percentage of bulk milk from herd A above the legal minimum in the dry period.

The results of the solids-not-fat tests were recorded. As in the case of the fat percentages, the average results of tests each month on pasteurised milk were included. The solids-not-fat content of the milk is dependent upon the protein uptake. It therefore gives a good indication of the nutritional value of the feed. There is also a definite seasonal trend in the results of the solids-not-fat tests on samples from all five farms and the general factory supplies. During the first few months, the results from all farms were high. However, the average solids-not-fat percentage for the months of September, October and November was 8.4. This shows the generally low standard of nutrition of the cows of the district during this period. It is obvious that on many farms cows were receiving even much below maintenance rations. The results for herds C, D and E were particularly low for several months, all being below the legal standard of 8.5. On the other hand, the results for farms A and B remained at a satisfactory level at all times and there was little variation between the level of solids-not-fat in the March-May period and September-November period.

Although it may be claimed that the dry season was particularly severe in 1958, the solids-not-fat percentages in the preceding years were similarly very low. This problem of providing adequate nutrition for cows in this period is therefore an annual one. Every year, grazing from non-irrigated pastures must be supplemented in some way so that milk composition is maintained at a satisfactory level. The farmer has to find the most convenient and most economical way to provide this additional fodder.

Milk Production

In addition to the marked effect on milk composition, the decline in the nutritional value of pastures has a very marked effect on production.

All farms which were included in this survey are primarily milk suppliers. The amounts of milk produced on the occasion of each test were recorded and from these figures the average production for each cow calculated.

Production figures for herds A and B are high throughout the 12 months. These good averages in October and November for herd B were obtained in spite of a severe outbreak of winter dysentery at the beginning of October.

Plate 2

Ideal Molasses—Kikuyu Pasture Near Millaa Millaa. Mixed pastures respond better to seasonal conditions.

In the results from farm A, small boosts in production were noticed whenever green forage crops such as fresh sweet sudan, green panic and legume, oats and field pea, or green para grass, was available during the preceding two days. There were marked daily fluctuations in production depending on the grazing, and generally there was good agreement between the figures obtained and the farmer's assessment of the quality of the pasture.

In the case of farm B, there appeared to be significant rises in production when certain good paddocks were grazed. It was also significant that there was a drop in production whenever paspalum grazing only was available to this herd.

The production from herds C and E declined steadily from July to November. The sudden increase in production in December was due largely to the provision of high quality lucerne hay and some other additional feeding. This lucerne hay was obtained from the south because of the extremely dry conditions and sold to the farmers at a relatively cheap figure because of freight rebates. In most seasons such a supply of cheaper fodder is not available. The rise in production when adequate feed was provided was spectacular and emphasises the loss in production from these herds because of the poor quality of feed available in September, October and November.

On farm D, considerable effort has been expended in applying top-dressing to pastures. However, the natural pastures only have been utilized and the results show that milk composition and production have still declined in the dry season. The production trends are related solely to rainfall for the area.

On farm E, a small quantity of elephant grass grown on the farm has been chaffed and fed to the cows in the dry months. However, this small amount of additional fodder was not sufficient to compensate for the poor quality of the pastures at this time.

Nutritional Deficiency

Summing up the results the problem is one of a general nutritional deficiency rather than of a low fat percentage which could be due to an unbalanced ration. Extra feeding is essential for part of the year, and the farmer has to consider the most economical way of providing this fodder.

Milk of satisfactory legal composition must be supplied. However, results show that when the cows are adequately fed so that milk of good compositional quality is produced, the amount of milk production during the dry season is maintained at a higher level. In this way the farmer benefits by better returns from the factory.

This period of generally low milk production coincides with the period of greatest milk sales for the year in this area of the State. The expansion of markets depends on the availability of more milk at this time. The farmer who feeds adequately, and keeps production up has the additional benefit of being able to sell all milk produced.

He thus gets better returns for the amount produced than at other periods of the year when portion of the production would have to be sold as cream.

With greater emphasis now being placed on milk production, the level of butterfat in the milk is not of such importance, provided it is always above the minimum legal standard. There has been a gradual change-over to breeds giving greater gallonage and lower fat level. Consequently, with such breeds of cows, the fat percentage will fall below standard more easily.

In all milk-producing areas of the State, the trend is towards the use of dairy refrigerators and the supply of night's and morning's milk. This will counteract a low fat percentage in morning's milk due to uneven milking intervals.

Good Feed In Dry Seasons

The seasonal decline in milk composition and production can be overcome if good feed is available to the herd in the dry season. It is not necessary to resort to heavy and costly supplementary feeding.

The advantage of irrigated pasture cannot be stressed too much. A relatively small area of fresh green pasture of good quality can maintain milk composition and production at satisfactory levels. Stands of lucerne, sweet sudan, green panic and guinea grass have been used successfully under irrigation.

The nutritional value of pasture grasses is improved when they are grown in association with legumes.

Plate 3

Sweet Sudan Irrigated Pasture. Maximum benefit is obtained by strip-grazing.

Strip-grazing allows the best use of the pasture available.

It is necessary to start irrigating early enough to maintain pasture growth. Maximum benefit from irrigation cannot be obtained when watering is commenced during advanced stages of drought.

Home-grown fodder conserved is the cheapest fodder other than pastures, and fodder can be conserved conveniently as silage. Even if irrigated pasture is available, some additional source of extra feed is needed when pastures start to decline before the irrigated pasture is grazed.

Silage can fill this need.

Additional feeding should be provided as soon as pastures start to deteriorate. Cows fed before losing condition will maintain a good level of production and will respond immediately to natural pastures when fresh grass comes again.

It is wise management to provide additional feed for cows before calving. Cows calving in good condition will respond with higher production of better composition milk.

The availability of a variety of different pastures or fodder crops provides good grazing over a greater period. Pastures which are frequently composed mainly of one species cannot provide adequate nutrition for the whole year.

Although natural pastures can be improved by top-dressing, this treatment of paddocks alone will not overcome the seasonal decline in milk composition. Additional feeding must also be provided.

The farmer who feeds his herd so as to maintain milk composition will benefit by increased milk production, which can be sold for the liquid milk trade during the period of shortage of supplies.

Orchard and Garden

Downy Mildew of Pumpkin and Marrow.—The unusually moist weather conditions which were experienced last spring led to a greater than usual incidence of downy mildew disease in the south-eastern districts of Queensland. Pumpkin and marrow growers should take the warning that extra precautions to cope with the disease may have to be taken.

Powdery mildew is the usual trouble with these crops for which sulphur dust is used. However, if downy mildew is present, then a zineb dust should also be applied regularly.

Downy mildew causes the older leaves to wither and die. If it is present, a close examination of the undersides of the leaves will reveal small water-soaked spots about ⅛ in. across, perhaps with a brownish centre. In severe cases these spots may be less than ⅛ in. apart, and are therefore very numerous. It is a trouble of which few growers seem to be aware.

—J. C. JOHNSON, Plant Pathologist.

Tomato Seedlings for Transplanting.—Success of a tomato crop is influenced greatly by the quality of the seedlings the grower transplants. Seedlings must be able to withstand the shock of transplanting and start making new growth after the shortest possible delay.

Raising these vigorous seedlings calls for special care and attention. The seedbed should be in a warm, open position. Shade causes uneven germination and irregular growth.

The soil should be worked deeply to improve its internal drainage and to get a uniform tilth on the surface. Without a fine, even tilth, at the surface, it's difficult to sow the seed at a uniform depth. Poor growth of the young plants can often be traced to an insufficient supply of phosphate. To avoid trouble, apply a handful of superphosphate to each square yard of the seedbed.

—K. FISHER-WEBSTER,
Senior Horticulture Adviser.

Marketing Summer Carrots.—During the last 20 years or so, we have witnessed an increased demand for carrots as a summer salad vegetable. Grated raw carrot served in combination salads is a popular choice for summer meals.

However, carrots marketed for this purpose, whether bunched, bagged or crated, should measure up to high standards as regards visual appeal and texture. Many growers are experienced enough to overcome production hazards but fail to realise the importance of marketing their produce in such a way that it appeals to prospective buyers. These growers are encouraged to wash and dry the carrots, grade them to relatively even size, and reject all specimens which are misshapen or show symptoms of nematode infestations or other ugly blemishes. Too many growers market carrots of mixed sizes and odd shapes. These do not appeal to the salad buyer and should be rejected during grading.

There are two grade standards for carrots: No. 1 and No. 2. Only the best quality should be included in the No. 1 grade, and they should be not less than 4 in. in length and 1½ in. in diameter. No. 2 grade may include those which are smaller and less attractive. The minimum size for these is 3 in. in length and 1 in. in diameter. Bags should be clearly marked to indicate the grade in each instance.

—C. M. APPS, Market Inspector.

Grafted Passion Vines.—The development of grafted passion vines has given a big boost to passionfruit plantings on farms and in home gardens.

These vines are grafted onto a variety of rootstocks which are resistant to the serious disease, Fusarium wilt. They are, however, just as susceptible as seedling plants to other serious pests and diseases.

Officers of the Department of Agriculture and Stock report that many inquiries have been received from farmers and gardeners about damage caused by fruit fly, woodiness virus and brown spot.

Many people apparently expect their grafted vines to be resistant to all major pests and diseases. This is not the case, and suitable precautions must still be taken to avoid losses.

Annual pruning is necessary. Regular spraying with a zineb or copper fungicide must be carried out during the warmer months to control brown spot. Regular spraying with 0·2 per cent. DDT will combat fruit fly when this pest is active. Pests such as red scale and mites must also be controlled by spraying when necessary.

It is essential to plant grafted passion vines to avoid Fusarium wilt. It is just as important to carry out routine pest and disease control practices to ensure a good, healthy crop.

Fertilizer Injury to Bean Seed.—Big areas of beans will be planted from February to June in Queensland coastal districts from the border right up to Cairns.

The bean crop is important and the plant has its troubles in the way of diseases, pests and climatic upsets. Enough hazards without adding fertilizer injury to the list. What is this injury? Usually, it's known as fertilizer "burn" and is caused by fertilizer coming into contact with the seed. The actual burn or injury results when fertilizer salt concentrations near the roots withdraw water from the plants. Symptoms range from partial or total loss of leaves to loss of the whole plant.

Poor germination, inferior seed, and other causes are sometimes blamed for patchy stands with numerous misses. Often, however, they are due purely to faulty fertilizer placement and resultant burn.

And the remedy is simple and in your own hands.

When the seed is sown, there should be a protective layer of soil—about 2 in.—above the fertilizer band in the drill. First open up the drill to 7 or 8 in., place the fertilizer then cover this with 2 in. of soil, and you are ready to sow.

A mechanical planter will place the fertilizer and sow the seed in one operation. Make sure, however, that depth adjustments are adequate, and that fertilizer and seeds run freely.

—*D. DOWLES, Adviser in Horticulture.*

Flower Colour

Some gardeners imagine that flower colour is influenced by fertilization or by climatic factors, but actually their effects are generally small. Flowers produced in full sun may appear slightly bleached or faded in comparison with those grown under light shade. Flowers produced at cool temperatures are often deeper coloured than when the temperature is higher. Likewise, foliage on evergreens growing in full sun is lighter in colour than when growing in partial shade.

However, hydrangeas, in which the colour of the flower is variable, depend to a considerable degree upon the soil reaction. In the presence of lime with ample amounts of nitrogen and phosphorus the flowers are a clear pink. Under more acid conditions the flowers range from mauve to blue due to the presence of more available aluminium. It is thus possible to vary the flower colour at will by the use of soil alkalising or acidifying materials.

Winners in the 1960 Wool Awards. At left are brilliant red wool swimming togs, modelled with an outsize beach bag; at right, the two special award winning entries.

New Process Makes Wool Non-Shrinkable

From Eleanor Knox, Australian Wool Bureau

A new process which guarantees total non-shrinkage of knitted woollen garments in normal washing looks set fair to bring a big expansion in the use of wool as opposed to synthetic fibres.

For with it, wool has taken over command in the last stronghold of the market previously the exclusive corner of synthetics—completely safe washability with no shrinkage and no loss of texture smoothness unconditionally guaranteed.

This new process is a feather in Australia's cap, for it has been developed by two Australian firms, with co-operation from a Swiss chemical firm.

The lengthy process which makes knitted garments for men, women and boys completely wash-safe has nine phases which have been evolved and perfected during 18 months' of intensive research which has cost one firm alone some £50,000.

Briefly, the process which brings to the consumer a knitted garment which may be tossed in the washing machine with impunity is as follows:

One—The wool yarn is knitted into lengths.

Two—It is put through a drying machine developed by one of the firms to take all the moisture content out of the fabric.

Three—It is passed into refrigerating chambers to bring back into it a controlled moisture content which can have a variation tolerance of ·05 per cent. only.

Four—It goes into autoclaves and has a dry chlorination gas put right through it.

Five—It passes into a liquid bath which removes all chlorination and all impurities which might be in the fabric.

Six—It goes through a bath which contains a special softening agent which is exclusive to the process.

Seven—It is moved to a hydro extracter which extracts loose moisture.

Eight—The fabric goes to drying machines.

Nine—It goes through a controlled press which produces a relaxed fabric non-stretchable in any direction.

Now, and at last, the fabric is ready for making up into the garments which are not only tossable into a washing machine, but have a softer and silkier texture than those which have not been shrink-proofed by this new and revolutionary process.

And garments which will retail in most instances at a lower cost than their synthetic rivals.

Which looks like making wool a winner all the way at long last.

For now, with this new process, it not only has all the washing qualities and non-shrink qualities of its synthetic sister, AND a lower retail pricing, but still has all its own peculiar attributes that no synthetic, however good, can acquire. . . its warmth, its breathing qualities, and its longer wearing qualities.

It is hard to assess accurately the longer wearing quality of wool as opposed to synthetics, but it is estimated that it must be at least 10 times greater now that this new Australian process has been evolved which permits perfect washing of woollens with no change in size or texture.

This estimate is based on the fact that, with constant wearing, a synthetic garment calls for washing 10 times as often as a pure woollen one.

Flowers In Winter

At this time of year we become almost squirrel-like in our endeavours to provide for the less abundant seasons, preserving fruit and vegetables, and making jams and sauces. Nonetheless we think of flowers and decorations.

One of the simplest and effective ways of preserving flowers is with borax. Flat flowers and those of open face variety preserve very well, that is zinnias, daisies, and so on.

Choose a strong cardboard box and cover the bottom with about an inch of borax. Place the blooms face down into the box and sprinkle borax round and between the petals until they are well covered. Leave for three weeks.

You could leave them until ready to use, but as the borax can be used many times the preserved blooms can now be transferred to another box until required.

When removing them, be careful not to break them as the petals become quite brittle. Surplus borax can be removed with a light brushing with a small paint brush. A more workable stem can be fixed with green pipe cleaners or florists' wire.

Another method of preserving is pressing between newspapers. Use flat, moisture-loving leaves and ferns. Spread out between newspapers and then press under heavy books or under a carpet. After a few weeks they will be quite dried and preserved and their colour retained.

More About Bookkeeping

by **J. PARK,** State Organiser, Junior Farmers

The "expenditure" side of the cash book will be written up from the cheque butts, and the total should agree with total debits shown in the bank statement. Note these examples taken from the "expenditure" side of the cash book.

Date	Particulars	Cheque No.	Date Approved	Amount	Total
1960				£ s. d.	£ s. d.
Feb. 2	Head office : 10 membership fees	596	1–2–60	2 10 0	
Feb. 3	B. Jones : Catering for dance	597	1–2–60	3 0 0	
Feb. 3	Hall committee : Hall hire	598	1–2–60	1 0 0	

Note that only the last three numbers of the cheque are used.

In the "date approved" column, the date of the meeting at which each payment is approved is inserted. Make certain that each payment is approved by a properly constituted meeting of the club, and that the names of the mover and the seconder of such approval are written in the minutes of the meeting.

A receipt must be obtained for every payment made.

At the end of the financial year when the "amounts" column is ruled off, make sure that bank charges, for example, exchange, cheque book, and so on, are also written up in the cash book.

Note carefully the way in which the cash book is "ruled off" at the end of the financial year. To obtain the surplus or deficit for the year, the amount shown in the "total" column on the "expenditure" side is carried across to the "receipts" side and deducted from the total shown in the "banked" column.

CASH BOOK

RECEIPTS					EXPENDITURE					
Date	Particulars	Receipt No.	Amount	Banked	Date	Particulars	Cheque No.	Date Approv.	Amount	Total
1960			£ s. d.	£ s. d.	1960			1960	£ s. d.	£ s. d.
Feb. 5	Membership Fee—				Feb. 2	Head Office—Fees ..	596	1–2–60	2 10 0	
	W. Brown	042	5 0		Feb. 3	B. Jones	597	1–2–60	3 0 0	
Feb. 6	Donation—				Feb. 3	Hall Committee—				
	S. Smith and Son ..	043	2 2 0			Hire of Hall ..	598	1–2–60	1 0 0	
Feb. 7	Gross Proceeds—					Cheque Book ..			5 0	
	Annual Dance ..	044	15 4 6			Exchange			1 6	
				17 11 6						6 16 6
Mar. 3	Membership Fee ..		5 0	5 0						
	Bank Interest ..			2 6						
Mar. 31	Total Receipts ..			17 19 0						
	Deduct Expenditure ..			6 16 6						
	Surplus for year ending 31st March, 1960 ..			£11 2 6						

The "net receipts" figure of £11 2s. 6d. should be "agreed" with the bank balance as at that date in the following manner:—

"RECONCILIATION"

	£ s. d.
Cash Book Balance	11 2 6
Deduct cash not yet Banked	5 0
	10 17 6
Add cheques drawn but not yet presented at Bank No. 598	1 0 0
Bank Balance as per Bank Statement	11 17 6

When the books have been ruled off as shown, the treasurer will prepare a statement or report for submission to the annual meeting.

RECEIPTS.

	£ s. d.
Membership fees	0 10 0
Donations	2 2 0
Gross Proceeds of dances	15 4 6
Interest	0 2 6
	£17 19 0

EXPENDITURE.

	s. d.	£ s. d.
Head Office—Membership fees ..		2 10 0
Dance Expenses—Catering £3, Hall Hire £1		4 0 0
Bank charges—		
Cheque book	5 0	
Exchange	1 6	
		0 6 6
Net receipts for year		11 2 6
		£17 19 0

Each item of income and outgo has been grouped under certain broad headings, such as "membership fees," "donations," "dance expenses."

At the foot of the treasurer's statement there should be a certificate signed by the club auditor reading—

"I certify that I have examined the books and vouchers of the Junior Farmers' Club and found them properly kept and the above statement is a true extract therefrom.

Signed: Hon. Auditor."

A similar statement (without the auditor's certificate), covering the preceding month, should be prepared and presented by the treasurer at each regular monthly meeting.

In addition to the statement of receipts and expenditure presented to the annual meeting, the treasurer should prepare a balance sheet for presentation to this meeting on the following lines:—

BALANCE SHEET

(As at 31st March, 1960)

LIABILITIES	£	s.	d.
Sundry Creditors— (C.W.A. Hire of meeting Hall not yet paid)	1	0	0
Total liabilities	1	0	0
Surplus	13	2	6
	£14	2	6

ASSETS	£	s.	d.
Cash at Bank (as shown by cash book)	11	2	6
Club Library (at cost)	2	0	0
Subscriptions due (but not yet paid by members	1	0	0
	£14	2	6

Use Electric Mowers With Care

Accidents with electric lawnmowers should never happen. Yet they sometimes do, and investigations have shown that they are usually due to work or repairs done by an amateur electrician, or lack of care.

When using an electric lawnmower it is essential to use it so that there is no chance of its cutting the lead. Should this happen, however, then commonsense dictates turning off the power and pulling out the plug before touching the mower.

If this is not done, then the user is likely to receive an electric shock from any damp or metal part of the mower, which would become "live" after the breaking of the lead.

For the same reason the power should always be turned off and the plug removed before carrying out any inspection of the machine after a sudden stoppage.

The flexible lead should never be coiled around the shoulder, but allowed to trail on the grass, and the mower should be used only from a power outlet which is effectively earthed. A check by an electrician or the local supply authority will dispel any doubts on this point.

It is as dangerous to use a damaged or perished lead, or one with an improvised joint, as it is to use a mower connected to a lamp-holder or two-pin power outlet, which would not be earthed.

Safest kind of lead is the three-core, sheathed, flexible type, in good condition and preferably in one length. For extension leads only the approved type of cord extension socket and plug, fitted by a certificated electrician, should be used.

—*State Electricity Commission.*

Brucellosis-Tested Swine Herds

(As at 1st March, 1960)

Berkshire

Clarke, E. J., Mt. Alford, via Boonah
Cochrane, S., "Stanroy", Felton
Cook, F. R. J., Middle Creek, Pomona
Crawley, R. A., Rockthorpe, Linthorpe
Edwards, C. E., "Spring Valley" Stud, Kingaroy
Farm Home For Boys, Westbrook
Fletcher, A. C., "Myola" Stud, Jimbour
French, A., "Wilson Park", Pittsworth
H. M. State Farm, Numinbah
H. M. State Farm, "Palen" Stud, Palen Creek
Handley, J. L., "Meadow Vale", Lockyer
James, I. M. (Mrs.), "Kenmore" Stud, Cambooya
Kimber, E. R., Block 11, Mundubbera
Law, D. T., "Rossvill" Stud, Aspley
Lees, J. C., "Bridge View" Stud, Yandina
Ludwig & Sons, A. R., "Beau View" Stud, Beaudesert
O'Brien & Hichey, J., "Kildurham" Stud, Jandowae East
Orange, L. P., "Hillview", Flagstone Creek
Pfrunder, P. L., Pozieres
Potter, A. J., Ascot, via Greenmount
"Tayfield" Stud, Taylor
Q.A.H.S. & College, Lawes
Regional Experimental Station, Hermitage
Rosenberger, N., "Nevrose", Wyreema
Schellback, B. A., "Redvilla" Stud, Kingaroy
Smyth, E. F., "Grandmere" Stud, Manyung, Murgon
Stark, H. L., "Florida" Stud, Kalbar
Thomas & Sons, F., "Rosevale" Stud, Laravale
Traves, G., "Wynwood" Stud, Oakey
Weier, V. F., "La Crescent", Clifton
Wolski, A., "Carramana", Warra
Young (Jnr.), W., Kybong, via Gympie

Large White

Assenbruck, C., Mundubbera
Barron Bros., "Chiltern Hill", Cooyar
Bell & Son, E. J., "Dorne", Chinchilla
Butcher, Dr. B. J. & Parnwell, A. J., Plunkett, via Tamborine
Clark, L. D., Greens Creek, Gympie
Duncan, C. P., "Hillview", Flagstone Creek
Fowler, S., "Kenstan", Pittsworth
Franke, H. J., "Delvue" Stud, Cawdor
Garawin Stud Farm Pty. Ltd., 657 Sandgate Rd., Clayfield
Gibbons, A. E. H., Mt. Glorious
Gibson, H., "Thistleton" Stud, Maleny
H. M. State Farm, Numinbah
Hall, M., "Milena" Stud, D'Aguilar
Heading, J. A., "Highfields", Murgon
Horton, C. J., "Mannuem Brae" Stud, Mannuem, Kingaroy
Hutton, G., "Grajea" Stud, Cabarlah
Jensen, S., Rosevale, via Rosewood
Jones, K. B., "Cefn" Stud, Clifton
Kahler, J. & S., East Nanango
Kanowski, A., "Exton", Pechey
Kennard, R. B., "Collar" Stud, Warwick
Larsen, H. L., "Oakway" Stud, Kingaroy
Law, D. T., "Rossvill" Stud, Aspley
Lees, J. C., "Bridge View", Yandina
Lobegeiger, L. C., "Bremer Valley" Stud, Moorang, via Rosewood
Mack, A. J., Mundubbera
Neilsen, L. R., "Sunny Hill," Ascot, via Greenmount
Neilsen, A. R., Ascot, via Greenmount
Palmer, V. P. & Son, "Remlap", Greenmount
Pampling, G., Watch Box Rd., Goomeri
Postle, R., "Yaralla" Stud, Pittsworth
Powell, R. S., "Kybong", Gympie
Q.A.H.S. & College, Lawes
Radel, V. V., Coalstoun Lakes
Radel, R. M., Coalstoun Lakes
Regional Experimental Station, Biloela
Robinson, O. R. & O. J., "Linvale", Argoon, Biloela
Skyring, G. I., "Bellwood" Stud, via Goomeri
Stanton, H. R., "Tansey" Stud, via Goomeri
Stewart, L., Mulgowie, via Laidley
Stumer, K. F., French's Creek, Boonah
Wharton, C. A., "Central Burnett" Stud, Gayndah
Wieland, L. C. & E., Lower Cressbrook, Toogoolawah
Zahnow, W., Rosevale, via Rosewood

Tamworth

Armstrong, H. J., "Alhambra", Crownthorpe, Murgon
Booth, J. D., Swan Creek, Warwick
Campbell, P. V., "Lawnhill" Stud, Lamington
Coller, R. H., Tallegalla, via Rosewood
Fletcher, A. C., "Myola" Stud, Jimbour
Herbst, L., "Hillbanside", Bahr Scrub, Beenleigh
Kanowski, S. E., "Miecho", Pinelands
Potter, N. R., "Actonvale" Stud, Wellcamp
Regional Experimental Station, Kairi
Salvation Army Training Home For Boys, "Canaan" Stud, Riverview
Skerman, D. F. L., "Waverley", Kaimkillenbun
Stephen, T., "Withcott" Stud, Helidon
Thomas & Sons, F., "Rosevale" Stud, Laravale
Wieland, L. C. & E., Lower Cressbrook, Toogoolawah

Wessex Saddleback

Ashwell, J., "Green Hill", Felton South
Cooper, G. J., Neumgua
Douglas, W., "Greylight" Stud, Goombungee
Dunlop, J. B., "Kunawyn", Acacia Rd., Kuraby
Kruger & Sons, "Greyhurst" Stud, Goombungee
Law, D. T., "Rossvill" Stud, Aspley
Mack, A. J., Mundubbera
Scott, A., Wanstead Stud, Grantham
Smith, C. R., "Belton Park", Nara
"Wattledale" Stud, 432 Beenleigh Rd., Sunnybank

Large Black

Pointon, E., Goomburra

Landrace

Grayson, D. G., Killarney
Neilsen, L. R., "Sunny Hill", Ascot, via Greenmount
Neilsen, A. R., Ascot, via Greenmount
Orange, L. P., "Hillview," Flagstone Creek

Close Your Herd, And Keep Out Disease!

By B. A. WOOLCOCK and R. MILLAR,
Veterinary Services Branch.

A stockowner can keep infectious diseases off his property by maintaining a closed herd. Here is some advice on how to achieve a closed herd and increase your profits by avoiding disease:

Most farmers have heard of the efforts of Australia's quarantine service to keep out diseases such as foot and mouth disease and swine fever. Have you ever thought of yourself as a quarantine officer attempting to keep disease out of your own herd?

Our veterinary quarantine officers are very careful to see that only stock which are perfectly safe are allowed to enter this country freely. Where there is any doubt they apply a suitable period of quarantine before entry, and, if there s any serious risk, they apply a total ban. You, oo, can apply the same principles to your own herd and so prevent the introduction of disease!

Australia's greatest asset, as far as animal quarantine is concerned, is its boundary of shore-ine and broad stretches of ocean which have to be traversed. Your greatest asset in keeping your herd free of disease is a secure boundary fence.

The Closed Herd

What is a closed herd? It is simply a elf-contained herd into which only essential ntroductions are made and which is maintained n a state of isolation.

Those of you who have run into trouble with brucellosis and other infertility problems will know how disease can reduce profits. Yet there are many farmers in this State who, by maintaining closed herds, have kept these major disease problems out of their herds. Veterinary surgeons have frequently encountered disease-free herds on isolated farms onto which only occasional young bulls and carefully selected females have been introduced over the years. Such herds are usually free of such diseases as tuberculosis, mastitis, brucellosis and infectious diseases causing infertility.

It is suggested that you apply the three basic principles of quarantine to your own herd:

1 *Introduce only Safe Animals.*—You should avoid at all times making non-essential introductions to your herd. When you are forced to buy replacements, take advantage of Section 17 of "The Stock Acts" which, in effect, protects you for 7 days in the case of brucellosis and mastitis and for 30 days in the case of tuberculosis. You, therefore, have these periods in which to arrange

Plate 1
Poor Boundary Fences Mean Unauthorised Intruders.

for your veterinary adviser to make tests to discover these three important diseases.

You will be forced to buy periodically a herd sire. The only safe bull is one which has not been used for service. Therefore to be absolutely safe you should consider buying only very young bulls and holding these until they are ready for service. This is the only sure way to avoid the risk of introducing venereal diseases which cause infertility and abortion.

If you have to buy female replacements, the safest to buy are maiden heifers. The only other class which you should consider are springers, preferably springing heifers. In every case you must make sure that these females have been protected against brucellosis with Strain 19 vaccine. Springers are not so likely to introduce the infertility diseases but to make absolutely sure you would have to keep them away from the bull until at least the third heat period after normal calving.

2 *Apply Quarantine in Doubtful Cases.*—This principle applies particularly to introduced pigs and a quarantine or isolation pen is an essential on the farm. In the case of adult bulls you would be foolish to risk introducing vibriosis by allowing them to run with the herd without a period of isolation, during which they would be treated or test-mated with a small number of maiden heifers. All introduced cattle require isolation until tests for tuberculosis, brucellosis and mastitis are completed by your veterinary surgeon.

3 *Don't take any Risk with Disease.*—You wouldn't knowingly introduce disease into your herd, but many farmers take risks with disease by buying indiscriminately, by borrowing bulls or by allowing neighbours to bring in cows for service. All these practices lead to the introduction and spread of disease. In order to protect your own herd, you must apply a ban when there could be a risk. There is always a risk when you don't know the herd from which the stock on offer originate.

Plate 2

Calves and Pigs Grazing Together May Spread Disease.

Plate 3

Good Yards and Fences Mean Bulls Under Control.

The Closed Herd and Disease

Mastitis and infertility are our two major disease problems of the dairy industry. The economic loss to the industry in this State has not been estimated, but in 1955 in the United Kingdom the financial loss attributed to infertility alone was stated to be about £18,000,000. This staggering figure should at least stir us out of our complacency.

The infertility diseases of which you must be aware are brucellosis, vibriosis and trichomoniasis. Brucellosis you can control by adopting a policy of Strain 19 vaccination of all heifer calves. There are no vaccines available to assist you with the other two, which are venereal diseases. But close your herd and you will have no need to worry about them. Make your boundary fence stock-proof and you avoid the risk of their accidental introduction. Years of care and preservation of a herd may be lost overnight when a neighbour's cow or bull gets through a poor boundary fence.

The germs causing mastitis may be introduced by buying adult cows without taking precautions to see that they are free of this disease. Once mastitis is in it usually stays for a considerable period and it can cause a heavy financial loss.

Any of the infectious diseases may be introduced if you fail to give the matter some thought before buying. If you are in doubt, it will pay you to seek veterinary advice.

The closed herd is a means of insurance against disease and loss of production. You cannot afford to allow any of your cows to be unproductive. Unproductive cows mean larger herds and too many mouths precipitate feed shortage.

Some Don'ts.—Close your herd and strain up your boundary fence and you will have little to fear from infectious disease. Take note of these "DON'TS"—

1. DON'T buy adult bulls unless you are sure they have never been used or unless you are prepared to treat and test them under veterinary supervision.

2. DON'T borrow a neighbour's bulls.

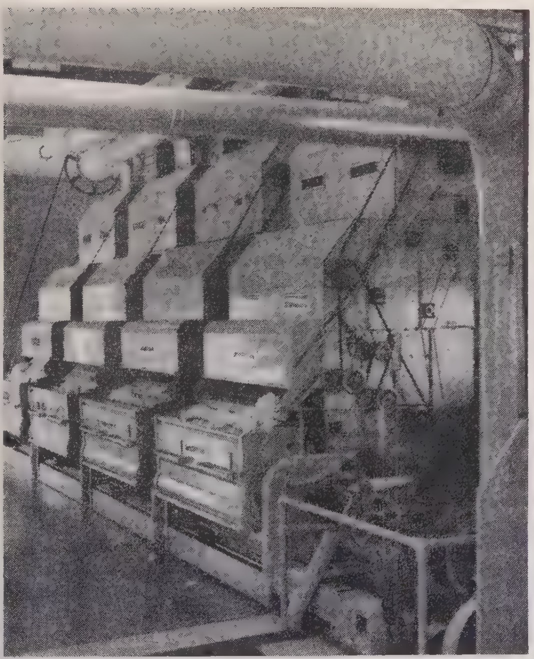
3. DON'T "hire" your bull out to a neighbour's cows.

4. DON'T buy adult cows without thorough testing by a veterinary surgeon for mastitis, fertility, brucellosis and tuberculosis.

5. DON'T let your cattle stray outside your own boundary fence and don't take the risk of letting your neighbour's bull get into your cows.

6. DON'T be complacent about disease, much of which can be prevented.

* * *



The New Gin Stand At the Rockhampton Cotton Ginnery, Showing Cotton in the Process of Ginning.

The Minister for Agriculture and Stock (Hon. O. O. Madsen, M.L.A.) Presses the Switch to Put the New Gins in Operation.

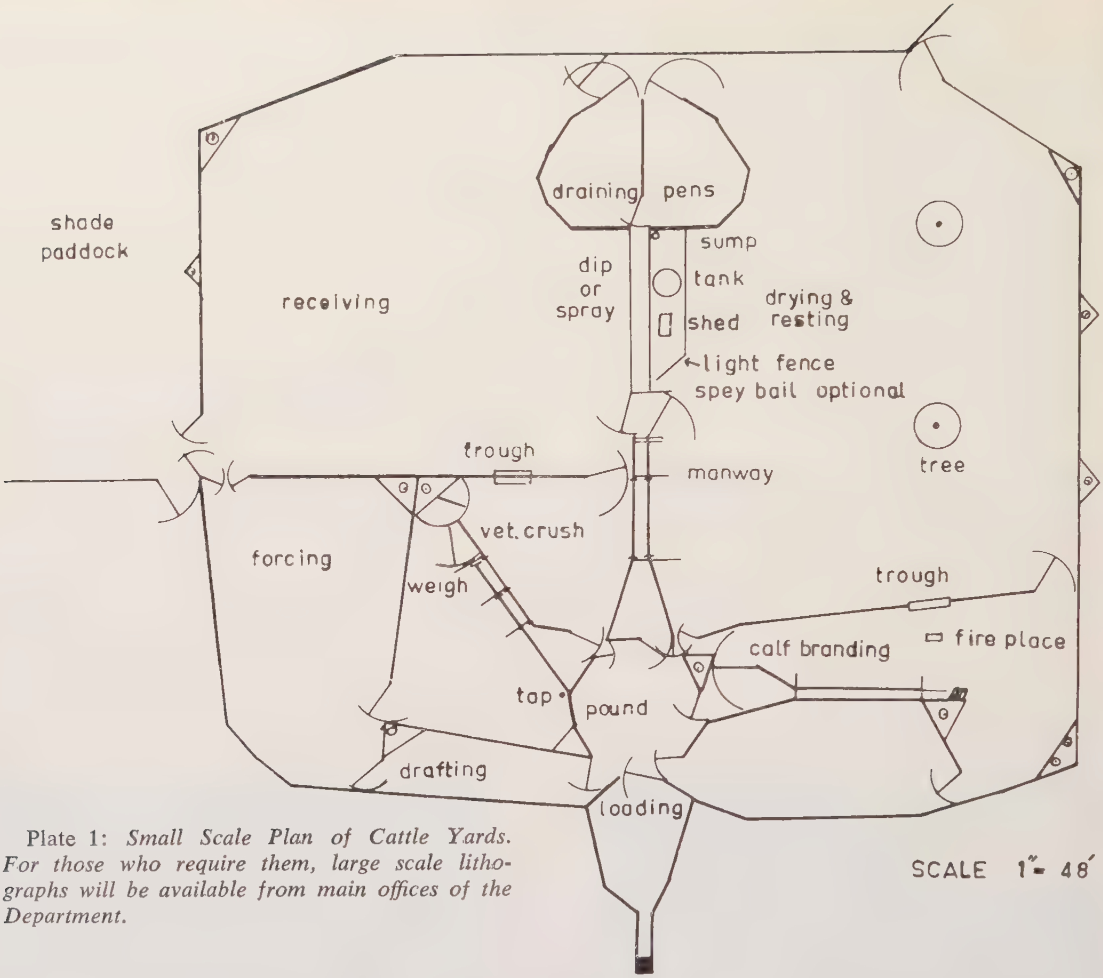

shade paddock
receiving
draining pens
dip or spray
sump
tank
shed
drying & resting
light fence
spey bail optional
tree
trough
manway
forcing
vet. crush
weigh
trough
calf branding
fire place
top
pound
drafting
loading
SCALE 1" = 48'

Plate 1: *Small Scale Plan of Cattle Yards. For those who require them, large scale lithographs will be available from main offices of the Department.*

Yards For Handling Beef Cattle

By Officers of Cattle Husbandry Branch

This article sets out the principles of cattle yard location, design and facilities. Included is a basi plan which can be modified to suit particular properties and types of enterprise.

Amongst cattlemen, there is a wide variety of opinion concerning the best type of yard. One reason for this divergence of opinion is that no one yard is best suited to all purposes. All agree that yards which hold stock securely and are convenient for the main operations are a necessity for the efficient working of a property.

Type of Yard to Build

The main purpose for which the yard will b used should influence the design. In ticky areas dipping or spraying of stock will be don frequently and easy access to the dip should b a consideration. Breeding properties requir good facilities for calf-branding, drafting o weaners, speying, inoculating and dehorning. When the main enterprise consists of buying stores and fattening, then drafting, loading and holding facilities will receive top priority. In any major set of yards it is wise to make provision for a crush for work of a veterinary nature and identification of stock.

Yard size is determined by the number of stock which require handling at one time. On the majority of properties, yards to handle from 250 to 300 head will be adequate. In many cases it will not be necessary to have yards of this size. When larger numbers are being handled consideration should be given to the provision of one or two small paddocks (say 25-50 acres in size) which would serve as holding paddocks while each group of 300 head was being handled.

Available finance may have to be considered—if so, it will be necessary to concentrate on the vital facilities in the first instance.

The facilities which are required will also influence the design and shape of the yards. For example, dipping or spraying facilities are not required on all properties. Where a dip is installed, draining pens or a draining race are required. The inclusion of a draining race has a considerable effect on yard design, since a length of 100 ft. to 120 ft. is required.

The temperament of the stock will also influence the type of yards, particularly on those properties which carry only a small number of beef cattle. When stock are quiet and handled frequently, sheep yards, if available, can be modified by increasing the height of the fence surrounding two or three yards. Existing posts may also need reinforcement. On the other hand, holding yards can be made by using No. 8 wire (or two strands of No. 8 twisted together) instead of rails. A wooden cap is desirable for strength. The use of some type of wire mesh can also be considered. In all cases a properly constructed cattle crush should be built as this is essential for adequate control of individual animals.

On large properties, more than one yard will be needed. Probably the best approach is to have a main yard situated as centrally as possible, with several "outside" or subsidiary yards at convenient spots towards the perimeter of the holding. These "outside" yards should be built primarily for a specific purpose which will naturally be the main husbandry activity on the property. Thus, in tick infested areas yards may be built for the purpose of using a mobile spray plant for tick control. A breeding property would build yards for calf branding and marking while a property supplying large numbers of stores would build, not yards, but holding paddocks for groups of cattle when mustered.

Yard Location

The actual site of the yards is the next consideration.

Soil type is important. Coarse sandy soil is probably the best as it drains well, doesn't bog down and creates less dust than other types. Clay soils become waterlogged and bog easily; silty types also bog readily and are very dusty. Stony yards should be avoided because of the likelihood of injury to both stock and stockmen.

From the drainage angle, it is an advantage if the yards can be built on a gentle slope to allow surface water to run off. If the slope is too great, however, erosion becomes a problem. Slope of the ground has to be considered in the installation of a draining race in order to ensure the return of the fluid to the sump.

Stock are easier to yard up if yards are on comparatively high ground, without any obvious distractions. Cattle are naturally suspicious of secluded areas so the surroundings of the yards should be reasonably clear without being denuded of trees. Around the yards there should be no serious obstacles to the droving of stock. Thus thickets of scrub or wattles, trees with large overhanging branches, rocky ledges or outcrops and creek banks are all to be avoided. It may be necessary to fence off any small hazards which would otherwise interfere with yarding up. It is well to remember that animals prefer to work up a slope and are somewhat reluctant to move along a downward slope. The site should be above flood level and, if opportunity offers, should have protection from prevailing winds.

A supply of water is desirable at main yards. A creek or bore is the most likely source of supply and in either case the water will have to be taken to the yards by pipe line. When there are covered structures such as a calf pen, saddle shed or dip, a tank to catch the roof run-off will be useful where no other source of supply is available.

The working of a property is made easier if all yards can be reached by motor vehicle during the main cattle working season.

Water troughs should be provided in yards where cattle may be held for long periods. A water supply at the pound yard may be of use in settling dust but it is a difficult matter to eliminate dust without hard-surfacing of yards. However, frequent light waterings on dry days will reduce the discomfort caused by clouds of dust.

Good shade trees are needed in the large yards and in yards where stock are confined for long periods. All corners should preferably be rounded. By planting trees in sharp corners the tree guard serves a dual purpose. However, trees should not be located close to the draining pens or draining race owing to the blockage of return drainage by leaves.

Direction of prevailing winds should be considered in respect of the layout. A spray race should be at right angles to the wind to avoid wastage incurred when the wind blows straight through the race.

The spey bail and calf branding frame should be in such a direction that the prevailing wind carries dust from the pound yard away from these structures. This is because, normally, most dust accumulates in the forcing yard and pound yard.

Protection from bush fires is necessary each year. This can be done by having a cleared area surrounding the yards from which to "back-burn" against a fire or otherwise to burn or make a "fire-break" during a suitable time of the year.

Materials

The type of material to use in the construction of the yards will depend on availability, and cost of materials and cost of erection. The purpose for which the various yards are used should be kept in mind. When cattle are being worked at close quarters, as in a drafting yard, pound yard or crush, the fence should be absolutely secure and sufficiently strong to resist all the physical force an animal can exert. Shade, receiving and holding yards are not normally subject to the same stress since well-handled animals respect a fence when they are not rushed.

Posts will usually be wooden, of either round, split or sawn timber. The last is usually the most expensive to obtain but a little is saved in erection costs. Gate posts and corner posts are usually round, while split posts are used in the larger yards. In the case of "holding" paddocks, steel posts can be used effectively.

Rails can consist of round, split or sawn timber or galvanised piping. Plain wire of No. 8 gauge, either singly or twisted together, will be suitable under some conditions, as will wire mesh or steel mesh. Barbed wire is not favoured in the vicinity of yards. The overall cost, which includes the purchase and erection of the rails, is the important consideration. Each type of rail has its advantages. Round rails may be readily available but are comparatively slow to erect. In addition, an extra rail may be required in comparison with split rails, owing to the greater width of the split rail. In the case of split rails, extra labour may be involved in removing the splinters. Both sawn timber and galvanised piping rails are quickly erected but the purchase price is greater in many instances. The use of these materials makes for uniformity of rail spacing in the yard fence.

Specifications

Panels:—8 ft. panels from centre to centre of posts in main yards. 6 ft. panels for forcing and pound yards, crush and draining pens.

Round posts for corners and gateways:—12–14 in. in diameter, 3 ft. 6 in. in ground. Round posts used in panels: 10 in. in diameter, 3 ft. in ground.

Split posts:—10 in. x 5 in. free from heart wood, 3 ft. in ground. Split posts for shade or holding yard 7 in. x 4 in., 2 ft. 6 in. in ground. Posts for forcing and pound yards and crush 3 ft. 6 in. in ground.

Caps for forcing and pound yards and crush:—8 in. in diameter, mortised 4 in. into top of posts; remaining caps 6–7 in., mortised 3 in. into top of posts.

Split Rails:—10 in. x 3 in. free from knots; round rails 4–6 in. diameter; sawn rails 6–7 in. x 2 in. free from knots; galvanised piping 2 in.

All posts, and particularly the portion which is in the ground, should be treated with creosote or other suitable preservative.

Height of Yards

Shade and Holding Yards:—Posts 4 ft. out of ground plus cap 3 in. above post, total height 4 ft. 3 in. Spacing of wires from top of post in each case, top wire 12 in. (leaving a 9 in. clearance between underside of cap and top wire), 2nd wire 21 in., 3rd wire 30 in., 4th wire 39 in. The 4th wire is thus 9 in. from ground level.

Yards, other than forcing and pound yards and crush: posts 4 ft. 8 in. out of ground plus cap 4 in. above post, total height 5 ft. Spacing of rails (that is, the distance between rails) between cap and top rail 11–13 in., between rails 6–8 in., between bottom of lower rail and ground 11–13 in. These measurements will vary somewhat according to the width of rails. If 10 in. rails are used, two rails and a cap will suffice. When rails narrower than 10 in. are used, some adjustment will be necessary. An additional rail can be fitted or twisted No. 8 wire used. The class of cattle being handled will be the deciding factor.

Forcing and Pound Yards and Crush:—Posts 5 ft. 2 in. out of ground plus 4 in. cap, making 5 ft. 6 in. total height. When 10 in. rails are used, three rails and a cap will be ample with spacings as follow: underside of cap to top rail 12–14 in., between top and centre rails 6 in., between centre and lower rails 4 in., lower edge of bottom rail to ground level 8 in. Some variation will occur in these spacings where rails of different widths are used. As a rule, spacing between the cap and top rail may be up to 14 in., spacing of intermediate rails should be closer to avoid animals pushing their heads out between the rails, and the bottom rail should be no more than 11 in. from ground level. If young calves are handled in the pound yard, the bottom rail should be no more than 8 in. from ground level at the time of construction.

Calf Crush:—Posts 3 ft. 9 in. out of ground, 3 ft. in ground. Sawn timber rails are recommended to be fitted flush with the inside of posts. Top rail to be flush with top of posts with 3 in. spacing between rails. Four 7 in. rails are required. Distance from lower edge of bottom rail to ground is 8 in.

Fixing:—Posts to be mortised, size 6 in. x 3 in. on inside for split rails, 4 in. x 3 in. deep for round rails which are let in to fit flush with the inside of posts. When comparatively small round rails are used, it is better to reduce mortise size to 3 x 3 in. deep. Galvanised iron pipe to be fitted in flush with inside of post. Where round posts are used in panels on the inside of the crush, they are to be shaped flat on the inside and rails fitted flush with flat surface. Wooden rails to be bolted through post or wired around and/or through both rails and post.

Galvanised pipes can be held by ⅜-in. hook bolts.

Sizes and Dimensions

The size of the receiving yard should allow about 25 sq. ft. of space for every adult animal, assuming that all animals will not be concentrated in one yard for any length of time. A square yard with each side measuring about 85 ft. would give the necessary room for up to 300 head of adult cattle. A circular yard with a diameter of about 95 ft. provides an area of similar size.

The forcing yard should be designed to hold about one-third of the number accommodated in the holding yard, allowing about 20 sq. ft. for each adult animal. A yard 40 ft. x 50 ft. would provide enough space.

The drafting yard should hold 20–25 head, be comparatively narrow and taper towards the entrance into the pound yard. (Note.—The terms "receiving," 'forcing" and "drafting" yards are designated in the plan in this article. These yards are sometimes referred to as "holding," "receiving" and "forcing," respectively).

Pound yard size depends on several factors and on personal likes and dislikes. When labour is scarce and cattle are quiet, many men prefer to draft into the pound, rather than out of the pound. The pound yard then becomes a centre from which even lines of stock are distributed. If the practice of drafting into the pound is adopted, a diameter of about 16 ft. will be ample.

This size is also suitable should a cattleman wish to use the system whereby one man controls all the pound yard gates by means of rods operated from an overhead platform.

However, when the pound yard is used for drafting, the diameter of the yard should be increased to about 26 ft. for efficient working. A suitable size for a square yard for such a purpose is 24 ft. x 24 ft. Inside corners of a square yard should be fenced off to ensure a smooth flow of stock around the fence.

Drafting races are an alternative to the pound yard as a means of drafting. They are of two types. One involves a straight race with gates giving access to yards on either side. Gates open into the race and thus guide the animal through the gateway. Gates can be slightly offset and lightly spring-loaded or lightly counterweighted to ensure closure. All gates can be operated by one man at the entrance of the crush by means of a light rope attached to the back of the gate and working over a single pulley.

The second type involves the use of a very small pound yard with gates giving access to several yards. Gates are operated from an overhead platform by one man. This platform should be in a location where it does not baulk incoming or outgoing cattle. In both systems the man operating the gates has a rather restricted view of the stock and requires another man calling the yard for each animal.

Crush length should provide about 5 ft. 6 in. for each adult animal and a size to hold six head will be sufficient for most purposes. When large numbers of stock are vaccinated in a crush it is an advantage for the capacity to be increased to 12 to 15 head. Stock are easier to work through a long crush than through a short one.

The width of the crush is important in order to avoid difficulties which arise when stock attempt to turn in a crush. A slight variation can be made according to the size of animals usually handled but the clear inside measurement should fall within the range of 25 in. to 28 in. A 26 in. spacing should suit most purposes. It is considered that no worthwhile advantage is obtained from having crush sides tapering outward at the top instead of being perpendicular.

Tapering of the calf crush is useful as stockmen are better able to control calves with the extra room provided by the tapered sides. However, it has one disadvantage when branding well-grown calves. On occasions, one calf may climb on his mates and try to get over the fence. It's quite possible he will fall backwards and lodge on his back in the crush. Calves are difficult to release from such a position. For this reason some consider that perpendicular sides are preferable, with an inside clearance of 16–17 in. A tapered calf crush should be 14 in. wide at the bottom and 17 in. wide at the top, both being clear inside measurements. A length of 20–24 ft. is satisfactory for a calf crush. The waiting pen, which holds the calf prior to its entry into the branding frame, is 4 ft. 9 in. in length. A length of about 6 ft. should be allowed for the branding frame with ample room at the sides for the operation of the frame.

Gates:—The main entrance and exit gateways should have openings of 12 ft. and be fitted with either one single 12 ft. gate or a set of double gates. Double gates place less strain on gate posts. For the opening between the receiving yard and the forcing yard and also the exit from the draining pen, single, 10 ft. gates can be used. Otherwise gateways of 8 ft. are suitable with the exception of those out of the pound which should be 5 ft. 6 in. for adult animals and 4 ft. 6 in. to 5 ft. for calves and weaners.

Slide gates are fitted in the crush behind the spey bail, at the entrance to the dip or spray race and at the beginning of the crush. The calf crush should also be fitted with two slide gates—one at each end of the crush. Slide gates should be of sufficient width to allow the vertical frame to fit between the round posts at both sides when the gates are shut.

Timber for gates should be 6 in. x 1¼ in., sound and free from knots. Bolts should be used in assembling gates.

Operation of Yards

Exit gates fitted to the pound yard should all open in one direction to take advantage of the tendency of stock to move along the fence. There is no general agreement regarding the opening of the gates of the pound yard. Those who advocate that gates open outwards claim that stock work better as they will walk through from either the left or right hand side and the stockmen can use the gate as protection from charging stock. Further, it is claimed that stock moving around the edge of an inward swinging gate are likely to partly close the gate on themselves.

Inward swinging of gates is usual when all gates are controlled by one operator from a platform. The claim is made that stock are easier to block when a gate swings shut against them as they tend to close the gate themselves when attempting to push through. When labour is in short supply and stock are quiet it would appear that inward-swinging gates are an advantage.

Cross Caps:—Cross caps are very useful in preventing the sagging of the sides of the main crush. Caps holding gate posts have a similar function. On the other hand, some cattlemen consider that they are an obstruction.

The nature of the ground surrounding the posts is a consideration. If there is much clay the posts will be subject to pressure and difficulty will be found in keeping them plumb. Caps are of assistance under these circumstances. When used above gateways, a minimum clearance of 6 ft. 6 in. from ground level should be provided around yards where men are moving on foot.

It is usually impracticable to provide gate caps sufficiently high to admit a man seated erect on a horse in the case of gates at the entrance to holding yards. The alternative is to either dispense with caps for outside gates or expect horsemen to be always alert in avoiding injury.

Manways:—These are narrow openings which permit stockmen to move readily from yard to yard or from one side of the crush to the other. A width of 10 in. is ample for the purpose. Manways add considerably to the convenience of working, especially around the crush weighbridge and bail. An objection which is raised is that calves can either get through or become caught in the openings. This occasionally happens and if trouble is being experienced in this way there are several means of overcoming it. One is to nail pieces of 3 in. x 2 in. on the inside of both posts to a height of 2 ft. 6 in. above ground level. This reduces the size of the opening to 6 in. which will stop calves but still allow a man's legs to go through. Another alternative is to fit a "gate" or a "flap" on the manway. This "gate" should open against the side from which the calves attempt to get through or it can be fitted with springs on each side which keep it centred. This acts as a bluff and calves make no attempt to push it open.

Manways should be provided behind the slide gate at the rear of the spey bail, at the entrance to the dip and also at the commencement of the crush. When pound yard gates open outwards, manways between the outside of pound yard fence and fences radiating from it permit quick movement from gate to gate if required.

Optional Structures

Saddle and Equipment Shed:—This may not be required on all properties but at many yards there is usually some equipment requiring protection from the weather.

Roof over Calf Branding Frame:—Opinion is divided on this point. If built, care should be taken to ensure that the posts do not become an obstruction and also that the roof is sufficiently high to permit entry of sunlight to the whole of the covered area.

Loading Yard and Ramp:—There is a trend towards increased use of motor transport of cattle. A loading yard which includes a ramp is likely to be required in most main yards. Some men prefer to build the loading ramp at right angles to the loading yard. It is claimed that cattle load up better with this arrangement. The end of the loading ramp should be fitted with a hinged "tail board" which can be used to overcome any difference in height between the ramp and the floor of the motor vehicle. The ramp should be extended on one side to serve as a platform along which attendants can walk on a level with animals.

Provision should be made for a weighing machine. The stationary type machine should be fitted into a crush but used only for weighing and veterinary work and not as part of a crush giving access to other facilities. The fittings of the crush used for veterinary work should be similar to those for a spey bail. The crush floor should be of concrete and a concrete apron extended outwards for 3 ft. on each side. The provision of a high overhanging roof is desirable. Where a mobile weighing machine is to be used a suitable approach crush in an accessible position is required. Stationary-type scales should be protected by a high, overhanging roof.

Stud properties may need facilities for work with artificial insemination. Insemination of cows can be done when the animals are restrained in the spey bail or crush, provided that a manway or gates are fitted immediately at the rear of the restraining structure. Similar facilities are needed for the work of pregnancy diagnosis.

When collections are being made from a bull for A.I. purposes it is considered desirable to have separate yards which are used solely for the purpose.

Some properties require a killing pen, which should comprise a small yard with a concrete floor fitted with suitable arrangements for disposing of blood, waste offal and ingesta. A supply of good water is required.

A D-shaped yard for catching young horses is used on some properties. It consists of one panel of about 12 ft. built preferably at right angles to the narrow end of the forcing yard and with access from it. The curved section of the D consists of a series of short panels. A gate is fitted in such a way that it swings from an "open" position which allows a horse into the yard and then operates inside the curve of the D to eventually form a crush with the straight 12 ft. panel. The gate head should be set about 3 ft. clear from the straight panel. The D yard should be fitted with smooth rails. Fence height should discourage a horse from jumping. A height of 7 ft. should be ample for the purpose.

A Basic Plan for Yards

A basic plan in Plate 1 has been prepared by Messrs. J. J. Sullivan and S. F. Lord, of the Cattle Husbandry Branch. Alterations to the plan can be made to suit individuals. For example, the plan allows for stock to be worked anti-clockwise—this could be reversed if desired. If the shade yard is attached, it can have gates into it from the receiving yard, drying and resting yard and the draining pens.

A separate spey bail and crush is shown, but this could well be incorporated in the dipping crush.

The relative positions of the gates into the receiving yard and the forcing yard should be noted. Cattle move freely toward the exit gate of the receiving yard and in so doing will pass readily into the forcing yard when required.

This plan differs in some details from the specifications quoted earlier. It is a good illustration of a basic plan which is readily adaptable to particular circumstances.

Further Details

The following available publications give details of the listed aspects:

Advisory Leaflets—

No. 33, "Cattle Drafting Yards"—Details of methods of fastening rails, fitting gate caps and the swinging of gates.

No. 66—"Good Yards for Cattle Drafting."

No. 59—"A Crush Bail."

No. 55—"A Calf Branding Crush and Cradle."

No. 62—"Safety Catches for Forcing Yard Gates."

No. 94—"A Double Acting Sword Bail."

No. 134—"Crush and Walk Through Bail Unit."

No. 161—"A Cattle Crush Slide Bail."

Merit Register For Dairy Cows

THE FOLLOWING COWS QUALIFIED FOR ENTRY INTO THE MERIT REGISTER DURING MARCH, 1960

Breed	Name of Cow	Name and Address of Owner	No. of Lactations	Total Production		
				Milk lb.	Average Test %	Butterfat lb.
	INTERMEDIATE MERIT REGISTER (3 successive lactations)					
A.I.S.	Valera Roseleaf 48th	Sullivan Bros., Pittsworth	3	25,265	4·4	1,118
Ayr.	Inverell Marlene	B. Goddard, Mount Tyson	3	25,618	4·3	1,102
G	San Jonda Carol	M.H.R. Raabe, Brigooda	3	30,861	4·2	1,304
J	Carnation Countess Crystal	W. Spresser and Son, Rosewood	3	27,067	4·8	1,288
J	Trecarne Seashell 2nd	D. Wadley, Indooroopilly	3	20,799	5·6	1,164
J	Keystone Laura 4th	Q.A.H.S. and College, Lawes	3	28,831	5·0	1,452
J	Nindethana Golden Gift	D. Wadley, Indooroopilly	3	23,370	4·9	1,140
	LIFETIME MERIT REGISTER (Minimum 2,240 lb. butterfat)					
A.I.S.	Chelmer Honeysuckle	A. R. Hayes, Tarampa	6	54,084	4·1	2,243
Ayr.	Ainslie Rena	E. Mathie and Son, Maleny	8	58,984	4·0	2,343
J	Elsecar Graceful Beulah	T. Nock, Dallarnil	7	50,323	4·6	2,330

Heliothis Control In Linseed

By T. PASSLOW, Entomologist,
and A. W. S. MAY, Senior Entomologist.

In some seasons in Queensland, severe damage is caused to linseed crops by the Heliothis moth, which can be controlled most effectively by boom spraying with DDT, as described:

Heliothis, which attack many cultivated crops, are primarily pests during seed production. The caterpillars, or grubs, cause damage in linseed by tunnelling into the capsules and feeding on the developing seed. When seasons are early, and also in late-planted crops, terminal damage is not uncommon before flowering.

When present in large numbers Heliothis may cause almost complete loss of the crop.

Life History and Habits

The moths are stout-bodied insects with an average wing expanse of 1½ in. The forewings are coloured in shades of grey brown or pink and the hindwings in grey to grey brown with a large marginal smoky area. When disturbed, the moths have the peculiar habit of flying low and rapidly over the crop and alighting again within 50 yards.

Each female is capable of producing large numbers of eggs, which are deposited singly on the growing points and flowers.

Caterpillars hatch out after three to four days.

Heliothis larvae crawl about the plants feeding on the buds, flowers and developing seed, although small larvae sometimes feed for days entirely within a boll. When fully grown, after 18 to 22 days, they measure up to 2 in. and are green to brown with varying degrees of black pigmentation. Grubs of different sizes may be found in a linseed crop but all belong to the one generation, being the progeny of the moths which emerge from the overwintering pupae. This emergence commences with the warm weather of early spring and may continue for 3 or 4 weeks.

Control

Boom spraying, applying not less than 15 gall. of spray to the acre, is the most effective method of Heliothis control in linseed.

For best results, DDT, in emulsion form, should be used at the rate of 1 lb. of active insecticide to the acre, irrespective of the volume of spray applied. If spraying is carried out soon after moths are active in the crop, and if most of the larvae are no more than ½ in. long, ½ lb. of active insecticide to the acre is sufficient for commercial control.

In recent years aerial spraying has been used extensively on linseed; experience has shown that this method of application is at its best when Heliothis is not present in large numbers.

Heliothis is not present in pest numbers in linseed every season, the population being dependent to a large extent on the weather, and on food supply during the previous autumn. The practice of routine spraying is therefore an unnecessary expense in seasons of low Heliothis population.

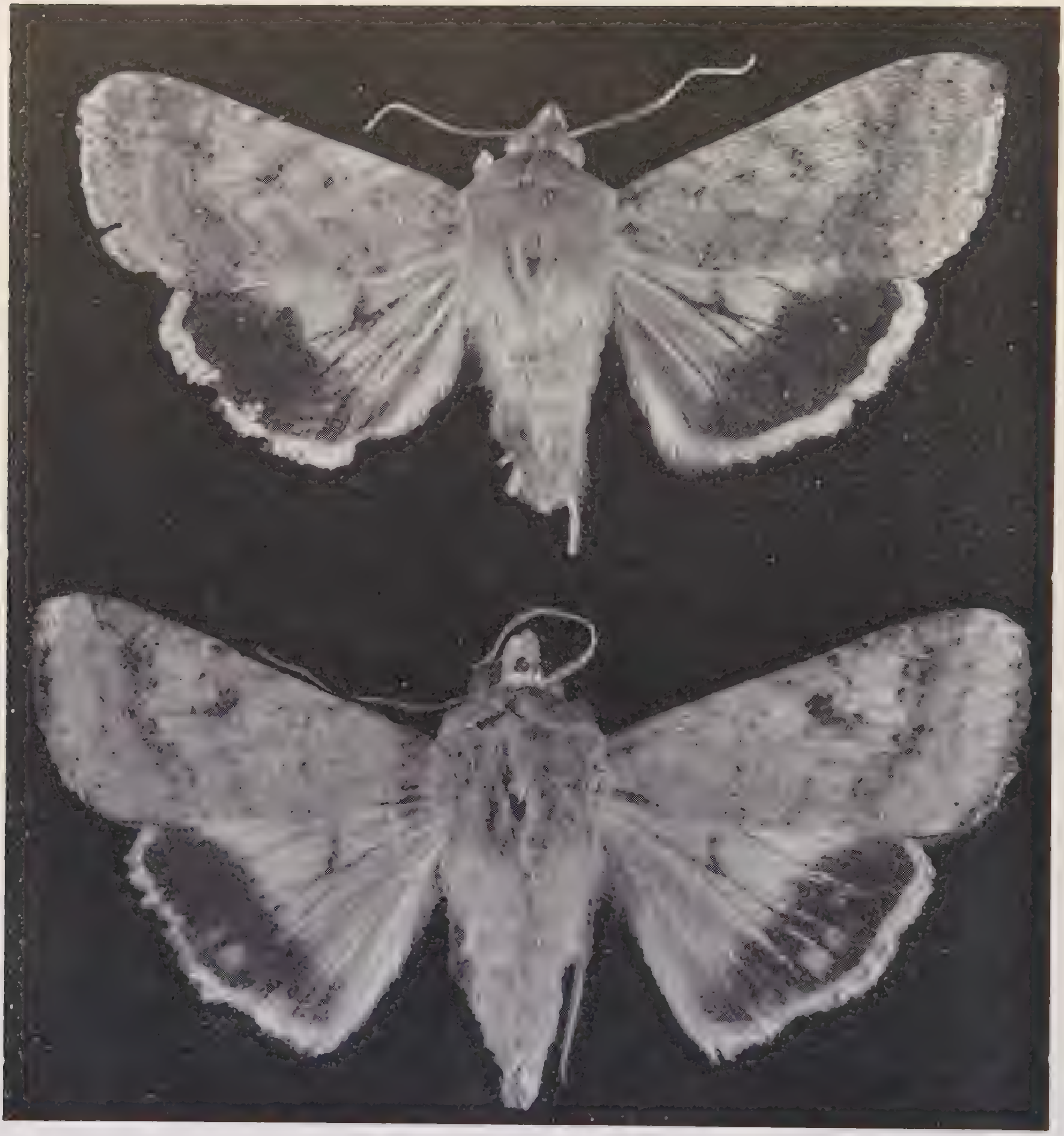
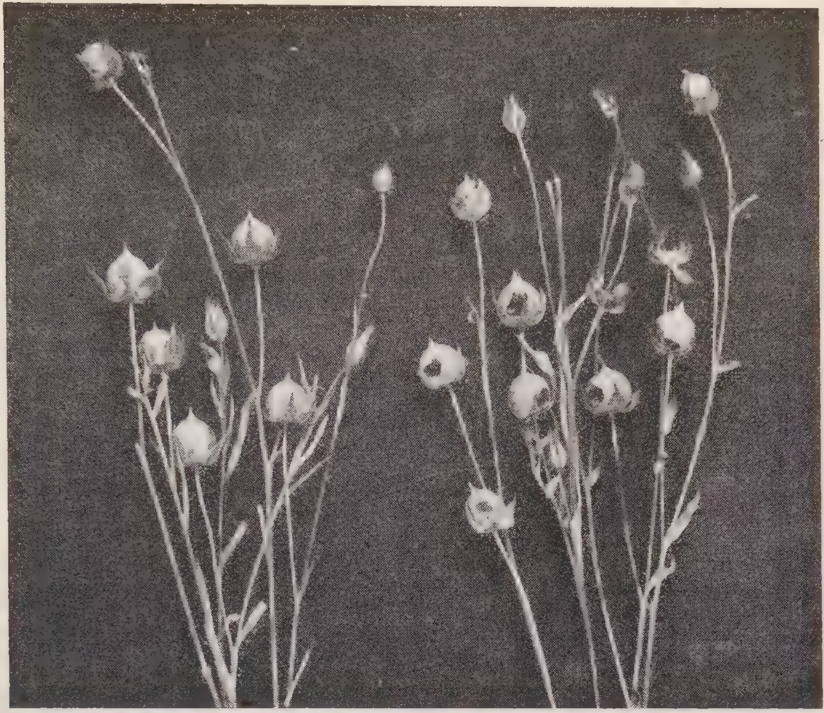


Plate 1

Heliothis Moths: *Heliothis punctigera* **Wallengr. at top, and** *Heliothis armigera* **(Hübn.).**
(These moths are 3½ times natural size.)

Plate 2

Linseed Bolls, Undamaged (left), and Damaged by Heliothis.



Careful crop inspections for the presence of moths, particularly during flowering, will indicate whether spraying will be necessary. If large numbers are present severe damage can be expected.

Prompt action minimises crop damage and also allows the use of the less costly dosage rate. More than one spraying is seldom required in southern districts. In Central Queensland, however, repeat treatments are usually necessary to control reinfestations.

Early planting lessens the risk of Heliothis damage as moths usually do not deposit eggs before mid-September in southern districts, and August in Central Queensland. In normal seasons such crops do not produce flowers before these times, and therefore are not attractive to the moths. Early sowing, however, does not guarantee escape from Heliothis attack and the usual crop inspections should be carried out. Furthermore, in some districts frost hazard must be given due consideration.

* * *

Spray For Bullrushes

"T.B." of Dalby, has inquired how to eradicate bullrushes growing in a dam on his property.

Answer:—Bullrushes may be eradicated by using dalapon at the rate of 10 lb. to the acre. Dissolve the dalapon in not less than 50 gall. of water and spray the rushes, making sure to wet them thoroughly. The best time to apply the spray is when the rushes have a maximum of leaf growth and a minimum of flowering stalks. It will probably be found that two applications, one in one season and another in the following season, will be required to eradicate the rushes.

Pasture and Crop

Quick Silage Making.—Often the farmer planning a fodder conservation programme wants to know which method of ensiling green material is the quickest.

An answer to this question is available as a result of an inquiry carried out by the National Agricultural Advisory Service of Great Britain. The silage-making programme of 31 farmers was examined and of these, 24 farmers were using forage harvesters of the flail type.

These are the findings—and they are well worth thinking about—but remember they apply strictly to English conditions!

In 1948, before the general appearance of forage harvesters, the average time for silage making with a buck rake was 95 man-minutes per ton. With green crop loaders (which we seldom see in Queensland) it was 155 man-minutes. Forage harvesters were giving a figure of 72 man-minutes a ton in 1955, and three years later in 1958, this figure was halved to give 36 man-minutes per ton.

The survey also suggested that where annual tonnages are below 200 the operating cost per ton may be higher with forage harvesters than with buckrakes. But these calculations do not take into account the speed and ease of getting the job done and the effects on the quality of the silage.

Remember again, this was a survey of English silage-making experience. Keep in mind too that our principal silage crops are taller and tougher than theirs.

—*V. J. WAGNER, Chief Agronomist.*

Organise Groups to Tackle Erosion.—Farmers can share the benefits of watershed control by getting together and presenting a united front to the common enemy—uncontrolled runoff water. Everyone lives in a watershed, and if all in each watershed work together, they will keep runoff water under control.

Formation of soil conservation groups opens the way for discussion of problems common to everyone in a watershed. After all, no one knows better than the farmer what his problems are and what are acceptable solutions. If you have a soil erosion problem, you can be sure you're not alone. Your neighbours in the same watershed are bound to have a similar problem. If you feel you'd like to form a watershed group, consult your local soil conservation officer.

—*J. E. LADEWIG, Chief Soil Conservationist.*

Hints on Storing Seed or Grain.—When storing seed or grain, whether in bulk or bagged lots, moisture content must be kept below 14 per cent. High moisture content causes heating and quickly leads to the development of mould, and final destruction of the seed or grain.

Special hygrometers are available for determination of seed or grain moisture content.

Insects, particularly the weevil, must be kept under control for successful storage. Insects multiply quickly in most untreated seed or grain, particularly if the moisture content is high; causing further heating and mechanical destruction.

To guard against insects, seed for planting should be treated with a dust such as BHC or DDT and for grain a fumigant such as carbon bisulphide may be used.

Small quantities of seeds, such as vegetable seeds, are best stored in a household refrigerator where they will keep for years.

So remember, for successful storage make sure of—

A low initial moisture content

Treatment to prevent insect attack

A cool dry situation, where air may circulate freely.

—J. B. LINNETT, Inspector, Standards Branch.

Are Your Contour Banks Big Enough?—Have you ever had the experience of seeing contour banks fail? First one bank breaks, then the one below it. Then the one below that—and you end up with a wash from the top of the cultivation to the bottom, and precious topsoil out on the road.

These failures can occur with an uncommonly heavy storm even on perfectly good banks. But, when all of your neighbours' banks are solid and yours break, you can't just blame the heavy rain.

Contour banks will not work properly if they aren't big enough. Build them to the specified size. Make them bigger if you like. Many of our leading growers consider the cost of building bigger-than-average contour banks is well worth while.

Remember too that your banks will gradually lose height over the years. Watch for this, particularly if you use a chisel plough.

To maintain size you can have the banks topped up every few years with a grader. You can even do the job yourself with a disc plough. Or you can use a disc plough on the banks every year, using your chisel plough in the space between the banks.

If you do all your ploughing with a disc or mould-board plough special topping up should not be necessary. But you **must** plough so as to leave a finish out furrow in the channel of the contour bank. Do this every second year and your banks will stay big.

Your banks can be big enough for 99 per cent. of their length yet have a few weak points which will cause trouble. Watch for low spots where the bank crosses old gully lines. Build the bank up extra high at such points.

—J. ROSSER, Soil Conservationist.

Cowpeas Next Best to Lucerne.—If you can't grow lucerne on your farm, you should consider cowpeas. Cowpeas have almost the same stock food value as lucerne and will grow on a wide range of soils.

Cowpeas can be used for grazing, hay or silage, and are also a valuable green manure crop. Cowpeas do best under warm, moist conditions, but once established the crop has a marked capacity to survive dry spells. It can be grown in all coastal districts and also in inland areas.

Popular cowpea varieties are Poona, Reeves, Cristaudo and Giant. In the past, the Poona variety has been preferred, but recently it has lost some of its popularity due to its susceptibility to stem rot disease. On soils with a history of stem rot disease, use the newer varieties Malabar, Havana, Santiago and Blackeye as these become available.

—V. J. WAGNER, Chief Agronomist.

Plough Early for Irrigated Pasture.—Success in establishing irrigated pasture depends first of all on early and thorough land preparation. Heavy planting rates will seldom compensate for skimpy land preparation, as germination is usually poor in a rough and uneven seedbed.

Many failures with irrigated pastures have been traced to hasty preparation of the seedbed.

Although irrigation promotes early pasture growth, it helps the weeds to thrive also. Weed competition can be especially troublesome before the pasture has made effective ground cover. Unless weeds are controlled by mowings, pasture growth will be retarded. Close mowing, however, will also check pasture growth. Weed competition can be effectively reduced by early land preparation which allows the weeds to be destroyed as they germinate.

Summer weeds can be suppressed by planting a fodder crop in the late spring of the season before it is intended to plant the pasture. The fodder crop should be grazed and turned under in time to allow the crop residue to decompose completely before the pasture is planted in April or May.

A fine textured, firm, fertile and weed-free seedbed is necessary for the successful establishment of small-seeded pasture grasses and legumes. A firm seedbed reduces the danger of planting too deeply. It also holds the moisture near the surface, giving an even germination.

Rough, spongy or trashy seedbeds can result in poor germination and unsatisfactory early growth. Weeds use up soil moisture and soil nitrogen, and should be controlled by regular cultivation. A fertile soil, well supplied with moisture promotes rapid growth of the young pasture.

If the soil is dry, an irrigation shortly before planting is worthwhile. This replenishes the soil moisture, firms the soil and germinates the weed seeds. A harrowing just before planting will destroy the weed seedlings.

—*A. NAGLE, Irrigationist.*

Pest Destroyers.—There are now over a thousand pest destroyers available in Queensland and farmers should make a careful selection when planning their pest control programme.

Many of the preparations have only one active constituent but in practice are effective against a large number of pests or diseases.

Other preparations contain two or more active constituents. When using these the grower should satisfy himself that each active constituent is necessary. For instance, when using a dusting mixture containing copper and DDT the copper is there to control fungus diseases and the DDT to control insects. If there are no insects present to be controlled there is no purpose in including DDT in the mixture.

Don't use preparations with unnecessary ingredients as costs are increased and no extra benefit is gained.

—*N. IRWIN, Standards Branch.*

Wheat Yield Trial.—Wheat yields from the dark-grey and black cultivated clay soils of the southern Darling Downs are not improved by fertilizing with superphosphate.

In fact, average results from five years' trials by the Agriculture Department showed that yields were actually reduced slightly. The trials were at the Hermitage Regional Experiment Station on a gently sloping paddock which had been under cultivation for the previous 30 years.

Eighteen experimental plots were established, superphosphate at the rate of 2 cwt. to the acre being applied to one half of each plot, the other half remaining unfertilized. During the plough-under of the stubble in early summer, depths of 4 in., 6 in. and 8 in. respectively were used. As the fertilizer was applied in the plough furrows, its placement was also at the three depths.

Average yields over the five-year period showed that plots which had received applications of superphosphate were outyielded, to a small but statistically significant extent, by those receiving no fertilizer. In two years this did not apply. In the first year, when heavy and excessive rain caused severe lodging, particularly in the fertilized and deeper ploughed plots, no differences in yields existed.

In 1957, which was the driest year on record for the district, plots treated with super significantly outyielded the "unsupered" ones. The average yield over the five-year period for the fertilized plots was 29 bus. to the acre while the untreated plots yielded 30¼ bus. to the acre.

Results from the different depths of ploughing were inconclusive. However, it was established that on these soils and slopes, in dry seasons, better yields can be expected from ploughing deeply, but that this benefit does not obtain in years of good rainfall.

Growth responses to depth of ploughing were observed during the first three years. In the first three years the deeper ploughed treatments generally made a bulkier growth than the shallower ploughed plots. Tiller production tended to be more numerous in the deeper-ploughed treatments. The two latter years of the trial were very dry years and no differences in growth of the crop were evident.

Very little growth response to the application of super was noticed, although in 1954, growth was generally more bulky in the fertilized plots, while in 1956, maturity was advanced by 2 to 3 days by the application of phosphate.

The results indicate that an increase in wheat yields cannot be expected by applying superphosphate to the heavier soils of the hillside areas. There are, however, many favourable yield responses to super reported from this district. But all of these occurred, as far as is known, on other than the shallow dark-grey to black clay soils. If the use of superphosphate is considered, some exploratory work should first be carried out by the farmer. He could quite easily add some super to the fertilizer box on a few odd runs during planting operations and judge for himself whether he gets any worthwhile response.

There were no significant changes in protein content of wheat due to depth of ploughing or to the addition of 2 cwt. to the acre of superphosphate.

Castor Bean in More Trial Plantings

By G. H. ALLEN,
Senior Agronomist, and
W. A. R. COWDRY,
Senior Experimentalist.

With industrial advancement there is usually change in demand for raw materials, and consequently the potentialities of likely new agricultural products are under constant review.

Oil obtained from castor bean (*Ricinis communis*) is one such product and although the main producing countries are Brazil, India, U.S.S.R. and the U.S.A. it is possible that eventually commercial production could be undertaken in Queensland.

The demand for castor oil has been increasing over the past 15 years and although its main use is for lubrication of jet engines, it is being utilized in the manufacture of plastic coatings for electrical equipment, special low temperature lubricants and in paints, varnishes and textiles.

Seed of the castor bean is poisonous and the residue left after oil extraction is not suitable for stock fodder.

There are several varieties of castor beans that are growing wild in Queensland. The most common one is that which is found growing quite vigorously along the banks of streams. This is of the same species as those discussed, but because of its habit of growth and indeterminate seed setting, it is not suitable for development as a crop.

Plate 1

A Typical Plant of French Castor Bean 10 Weeks After Planting.

Other plants, known locally as "wild castor bean" and "devil's apple," belonging to quite a different genus, are often confused with the commercial strains. They are more poisonous and cannot be compared in any way with the genuine species.

Problems of Production

Commercial production has not been undertaken in Queensland and results from a number of experimental plantings have indicated that although the crop can be readily grown, yields of seed have been extremely variable and unreliable.

The crop requires a frost-free period of 150 to 200 days and in the more tropical regions where these conditions occur, diseases are likely to cause considerable damage. Conventional harvesting equipment is not suitable, and variation occurs in height of plant, branching, seed shattering and disease resistance.

Several varieties of castor bean were grown some years ago by the New South Wales Department of Agriculture, but none proved suitable for mechanical harvesting. (*N.S.W. Agric. Gazette,* 67: 1 and 3.)

Preliminary trials in Queensland indicated that the available varieties and equipment for harvesting were unsuitable for commercial castor bean production.

However, the Commonwealth Department of Primary Industry has assisted in obtaining new varieties from America so that further studies on this crop can be initiated.

Work in the U.S.A. since 1947 has resulted in the production of improved varieties which combine disease and drought resistance with a growth form suitable for machine harvesting. The industry is still in the establishment period but one of the larger areas (7,000 acres) in Texas gave an average yield of almost 2,000 lb. to the acre, while in California average production of 2,600 lb. to the acre has been obtained. Prices to the American grower appear to be about £60 a ton for the hulled seed.

Tests on a small scale were commenced by the Department of Agriculture and Stock in Queensland in 1949. Eight varieties were grown on the Regional Experiment Stations at Biloela and Ayr and a variety known as Ricin d'Anjou, obtained from France, was grown at Biloela in 1951 and 1952.

Yields were not outstanding, but over 1,000 lb. to the acre of hulled kernels were obtained at each of the Stations in two of the four seasons in which the crop was grown. The oil content varied from 38 to 41 per cent.

Because of the habit of growth of the castor bean plant, difficulty was foreseen in the harvesting of the crop by mechanical means. Detailed observations of the plants themselves were therefore taken, so as to assess the relative value of the varieties for mechanical harvesting. Such factors as leafiness, branching, height, size of stalk, placement of the flowering spikes, rate of maturity both as a plant for final yield as well as in the individual seed head, were each taken into consideration, while the capsule shattering and kernel hardness after maturity were also examined.

Considerable variation was found in each of these plant characters. Heights varied from 36 to 70 in. and the size of stalk varied also. The colour of the stem, leaves and seed capsules varied from green through bronze to orange, while leafiness varied according to the vigour of the variety. The rate of maturity also differed and was closely connected with the relative size of the plant. This was also reflected by the size of the stalk and it was shown that the shorter varieties with thinner stems tended to branch earlier and to set their seed more quickly. Moreover, the setting of the seed was spread over a shorter period of time and, as would follow, a smaller distance up the plant than in the case of the taller, more vigorous varieties. This is of greater importance when considering their value for mechanical harvesting and would outweigh other quite important factors.

Effect of Plant Spacing

Varieties Q2893 (South African thornless) and Q2804 (from California) matured more evenly and seeded in a short period at both stations. It was therefore presumed that closer spacing, with an attendant close watch on moisture supply both during the growth of the crop and in the critical stage when approaching maturity, might give the best returns for acre.

At Ayr a test was carried out using Q2804 and an increase in yield was obtained by spacing the rows 24 in. apart instead of the usual 42 in., but closer spacings at Biloela did not give increased yields.

Q2893 possessed the added advantage of having practically spineless seed capsules, but they were small and rather tight-fitting around the seed.

A small area was headed mechanically. The result was not encouraging as the capsules were not threshed properly at the reduced speed necessary to avoid cracking. Later work on other crops, however, shows that this may be overcome by better timing of the harvest in relation to the maturity of the plant.

The French variety Ricin d'Anjou proved to be of suitable height and fruiting habit for straight heading, the leaves shedding as the pods became mature. However, the soft capsule and kernel caused unsatisfactory harvesting. Of the seed harvested, it was found that approximately 50 per cent. germinated if undamaged, but that even slightly damaged seed was not of much use for planting purposes. The oil content was not impaired greatly by seed damage during harvest. The seed capsules of this variety do not shatter readily and while this is a decided advantage if harvesting has to be delayed for any reason, it makes threshing difficult and was the cause of the poor sample of seed obtained.

Present Trials

Seven newer varieties of castor beans from the U.S.A. are under trial at the Biloela and Millaroo Regional Experiment Stations and two other varieties obtained from the Agriculture Department of the University of Queensland will also be grown.

Dr. P. J. Skerman of the Queensland University carried out trials with a number of these American varieties at Redland Bay during 1959 and obtained hand-harvested yields varying from 196 to 2,256 lb. to the acre. Three of the dwarf types which grow to a height of 3 to 4 ft. were reported upon favourably for mechanical harvesting.

Harvesting Problems

It is unlikely that commercial production of castor bean could be undertaken successfully here until suitable varieties are available and special machinery has been developed.

Some special harvesters have been built in America but cost about £2,500. Harvesting is done by beaters which knock the matured capsules and seed onto trays from which they are elevated to a hulling and cleaning mechanism. The crop is not harvested until the bulk of foliage is removed by frost or by chemical defoliants.

Information received from the Department of Primary Industry also states that special equipment is being developed in America to adapt conventional harvesters for castor bean crops.

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Farmers' Questions

Storing Seed Potatoes.—A recent inquiry seeks information about storage methods for holding seed potatoes.

Answer:—Seed potatoes have been successfully held in cold storage for lengthy periods. It is essential to maintain a constant temperature of 45 deg. and to spread the tubers out on storage racks which permit good ventilation.

As a general rule Queensland potato growers select their seed potatoes for summer or autumn plantings from the spring crop lifted during the October-November period.

Should any of the tubers being stored show any signs of disease or be suspected of being diseased, separate these from the whole and forward a sample to the Department of Agriculture and Stock for investigation and report.

Elephant Grass.—Several inquiries have been received seeking information on elephant grass.

Answer:—Elephant grass is a highly productive plant producing a large bulk of feed. It is a good grass for dairy production in frost-free areas of coastal Queensland. The most satisfactory way to use it, is as "chop-chop", though, with careful management it can be successfully grazed. The protein content of young elephant grass is about equivalent to that of mature lucerne, about 20 per cent.

The use of farmyard or nitrogen fertilizers together with irrigation usually improves the yield of this grass which, in various parts of the world, ranges from 10 tons to 40 tons per acre per annum. High yields have been recorded in Queensland.

It is planted in rows 4 to 8 ft. apart with 2 ft. between the plants in the rows.

Good management will allow elephant grass to ratoon well and of course this will improve its production.

A Service to Countrymen

Plate 1: Fattening on Irrigated Pasture at Ayr Regional Experiment Station.

Helping To Find The Answers For Dairyman And Grazier

Almost every day, science helps in some way to make less arduous and more rewarding the job of carrying on the vital food-producing industries in the tropical and sub-tropical areas of Queensland. At the hub of scientific activity in the twin worlds of dairying and cattle raising is a small band of men working in the Cattle Husbandry Branch of the Queensland Department of Agriculture and Stock.

This Branch of the Department, in the brief 12 years of its life, has already helped to bring about some unique and worthwhile advances in our dairy and beef cattle industries.

It would be hard to measure just how much these contributions mean in money saved or earned. They are recognisably valuable, however, and have done much to alter favourably the thinking and planning of many thousands engaged in the two industries—worth in conjunction a cool £88 million.*

Starting from scratch, the Branch has so far—

- Developed artificial insemination for dairy cattle in this State.
- Found facts on the feeding of dairy stock.
- Defined a growth rate pattern for beef cattle.

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* The 1958 figure.

- Found at least part of the answer to the economically important question of how to turn off a young beast for slaughter.
- Performed a lot of other useful services in both dairy and beef cattle spheres.

Little Work Before 1948

Before the setting up of the Cattle Husbandry Branch in 1948, very little research work had been done in Australia in dairy and beef cattle husbandry. Few facts on the growth rate of beef cattle or the production of dairy cows had been recorded. Knowledge of cattle husbandry was confined to temperate countries; only South Africa could contribute some information on adapting cattle to hot climates and on phosphate deficiency.

Departmental officers collected what they could from these sources; then set to work to find out for themselves what the conditions were here in Queensland.

Only after the Branch had planned this approach to the husbandry problems besetting Queensland's 20,000 dairymen and 6,000 graziers did these essential members of the State's primary producing community receive any real assistance in husbandry matters.

And today the wide and vital help available to them is restricted only by limitations of staff and funds.

At present, officers of the Branch are stationed at 18 centres in the State and there is a demand for men at more centres.

In its pioneering efforts, the Branch set out to—

- Get to know the producer's problems and win his confidence.
- Apply overseas findings to our conditions where advisable.
- Discover the basic patterns of production in herds.
- Recruit and train staff.

Work With Dairy Cattle

One of the first problems to be tackled by the Branch was that of infertility in dairy cattle. Few facts were available. Little or no information could be found on the exact nature and causes of infertility; whether cows and bulls or cows only were involved; the interval between calvings; the number of services required for each conception, and the influence of the plane of nutrition on the onset of oestrus, or heat period.

But when work started in 1952, about 100 co-operating farmers in all the main dairying districts began keeping full breeding records of their herds—and the number has now grown to 160.

Research workers looked into the large volume of information collected and drew up reports of "normal reproductive behaviour" of the herds of a district. Eleven such reports have been issued, plus two on a State basis.

From this work, the extension worker is able to advise producers when they should seek further advice on the breeding performance of their herds and also give advice appropriate to the particular district and the individual herd.

For instance, it has been found that 85 per cent. of cows come in calf within three services, so if a cow doesn't conceive in that period veterinary advice should be sought. Another interesting discovery is that on the coast the problem of a cow going five months without a heat period is believed to be due to its low plane of nutrition.

Present work on fertility takes in the study of those herds that have been able to use artificial insemination. The effect of A.I. in controlling infertility will be readily seen in such herds.

Artificial Insemination

Artificial insemination of dairy cattle in Queensland has been carried out in particular districts since 1955, and up to November last, over 16,000 dairy cows have been mated. It was used first as a means of progeny testing of bulls, in order that a number of bulls could be proved for production before being used to inseminate dairy cows in Queensland herds.

The first scheme began in the Nambour area, where about 50 herds are included. The co-operating farmers undertook to production-record the female progeny of the bulls used and to rear as many of the heifers as possible. Four Jersey bulls are used each year, and the aim is to have each bull represented by heifer progeny on each farm.

The A.I.S. breed is being used in a group of herds in the Kingaroy district, where otherwise the scheme is similar to that at Nambour.

To date, 25 Jersey and 9 A.I.S. bulls have been used. Each bull has been mated to not less than 250 cows in one season. Production records of the progeny of the first four bulls will be available shortly.

A new step was taken in November 1956, when a trial of artificial insemination in a group of herds in the Atherton area was begun. Both chilled and frozen semen were airfreighted from Brisbane. Satisfactory results led to the setting up of a small A.I. unit at the Department's Kairi Regional Experiment Station, in which three bulls of each of the Jersey and A.I.S. breeds were used. This resulted, early in 1958, in the formation of a co-operative farmers' group known as "The Tableland Artificial Breeders Association". The Cattle Husbandry Branch has helped and guided this association, which conducts A.I. field work over the dairying area of the tableland, keeping its own records, employing inseminators and collecting fees.

The supply of semen from the Jersey and A.I.S. breeds has been ample for needs and so far about 4,000 cows in 130 herds have been inseminated.

Nutrition in Dairying

A great deal of research and advisory work has been done in the subject of nutrition of dairy cows.

Studies have led to the present belief that in dairy herd nutrition the important thing is to maintain a reasonable standard of feed throughout the year. Dairymen are shown how to make the best use of the feed that is available to them. Advice is tendered on supplementary feeding—when to feed, and what feeds to use, having regard to the prices and food values of available fodders, and other factors which determine whether feeding is a practicable proposition.

Areas in the State that are deficient in phosphate and copper have been located. At the same time, dairymen have been advised that general nutrition must be checked before mineral deficiency can be treated successfully. For instance, phosphate deficiency is very often associated with a protein and energy deficiency, and adequate production levels cannot be obtained unless all three deficiencies are corrected.

The feeding of grain supplements to dairy cows on pasture has also been given a lot of attention and valuable information given to dairy farmers.

Producers, especially those in the milk zones, have been enabled to keep down cost of bought feed by the discovery and correction of small but important deficiencies in rations.

Other ways in which dairymen have been helped have been in the rearing of dairy cows on limited amounts of milk, also in the dehorning of herds. Advice on the dehorning of beef herds has also been given.

Queensland cattle husbandry officers continually keep watch on developments overseas and test those that have application here. In this work they receive the eager co-operation of producers, recent examples being the use of hormones in the fattening of beef cattle, and the tallow spraying of pastures as a means of bloat control.

Help to Beef Industry

Getting facts on growth rate patterns has occupied a lot of man-hours on the beef side of cattle husbandry work. Studies have been made on stock grazing native pastures in different districts and on different breeds in similar conditions. From this work has sprung information on the shortcomings of native pastures and on fattening by other methods.

At present being investigated are methods of supplementary feeding of young stock during winter and spring months, and fattening on improved pastures and crops such as oats and sorghum.

In the work on winter weight loss, various supplements are being tried in different parts of the State. The question of which animals to feed, what feedstuffs to use, when to start feeding and how much and how often to feed are all being investigated under field conditions. Once again seasonal conditions militate against the obtaining of reliable results in a short space of time.

At this juncture it would appear that a protein supplement will be the most useful.

The value of supplementary feeding is partly influenced by the later management of the animals. It will only be made to pay if the advantage produced by the use of the supplement is held until the animal is slaughtered.

Working with the Bureau of Agricultural Economics, the Branch started an investigation in 1958 on the costs and returns in crop fattening ventures. Studies on 18 properties in the Darling Downs, Burnett and Rockhampton districts have shown the relationship between meat price, meat gain for each acre of crop, and cost of producing an acre of crop.

From the following table, which is applicable to market conditions for stores and fats in 1958, it was demonstrated that for a crop producing 100 lb. of meat to the acre, the "break-even" cost above which it would not pay to produce the crop was £6 an acre where beef was £5 a 100 lb. carcass, or £8 8s. an acre when beef was £7 a 100 lb. carcass, and so on.

This table will also show that: If the crop is produced for £7 5s. an acre and the meat gain an acre is 125 lb. the meat would have to be sold at £5 for 100 lb. to break even, and anything above the £5 would be profit.

"BREAK-EVEN" CROP COST
(*£ per acre*)

Beef Price per 100-lb. Carcass Wt.	Meat Gain per Acre						
	50 lb.	75 lb.	100 lb.	125 lb.	150 lb.	175 lb.	200 lb.
£3	1·8	2·7	3·6	4·5	5·4	6·3	7·2
£4	2·4	3·6	4·8	6·0	7·2	8·4	9·6
£5	3·0	4·5	6·0	7·5	9·0	10·5	12·0
£6	3·6	5·4	7·2	9·0	10·8	12·6	14·4
£7	4·2	6·3	8·4	10·5	12·6	14·7	16·8
£8	4·8	7·2	9·6	12·0	14·4	16·8	19·2
£9	5·4	8·1	10·8	13·5	16·2	18·9	21·6
£10	6·0	9·0	12·0	15·0	18·0	21·0	24·0

Investigations are continuing, bearing in mind that no general recommendations can be made on the basis of one year's work. Apart from seasonal conditions which will alter crop productivity, the relationship between buying price of stores and selling price of fats will also vary from year to year.

Ways of supplying phosphate supplements to beef cattle have been tried and so far an improvement has been noted in animals receiving supplements.

Officers of the Branch have helped in feed-lot fattening enterprises by working out returns and weighing the cattle. They have also collected a volume of valuable and reliable local information that will benefit producers who are thinking of going in for feed-lot projects.

A lot of data have been gathered from work in carcass evaluation by measurement, and these may serve as a basis for a more objective method of commercial appraisal.

A valuable service to breeders and buyers of stud bulls is the weighing and measuring of animals. This service, carried out by the Branch at each Brisbane Show, had helped the grazier by showing the importance of weight for age in beef cattle production. The Branch has also developed a useful formula for calculating the weight from girth measurement. (This only applies to British breeds that have been reared and fed for show conditions.)

From observations on two properties over three years, reliable information has been gleaned on the age at which cattle erupt permanent teeth. Cattlemen now know how far they can rely on the "tooth test" in estimating the age of animals between 18 months and 3½ years.

Other research work has been done on the yield of milk from beef cows. Further results will help in finding the time of the year most favourable for the calving of beef breeders, and also the best time at which to wean the calves.

The Branch advises on all aspects of goat husbandry and on the feeding of horses used commercially.

Co-operation From Producers

So far as the man in the street is concerned, the work of the Cattle Husbandry Branch goes unrecognised, but the magnitude of its activities is known to many men in the industries of cattle raising and dairying. And those in the Branch know that they will be busy for many years to come on problems as yet unsolved affecting the husbandry side of the two industries. Most important is that they have earned the goodwill of large numbers of producers without whose co-operation their work could not be carried to fruition.

Bucket and Bail

Strain 19 Controls Brucellosis.—The severe abortion storms due to brucellosis which commonly occurred a little over 10 years ago, when over 30 per cent. of pregnant heifers and cows in a herd aborted, are met with only occasionally today. This is due mainly to the widespread use of Strain 19.

Strain 19 is a live vaccine which has a low virulence for stock, but has the ability to confer a high degree of immunity in vaccinated animals. The best age for vaccination is between four and eight months.

The majority of animals inoculated as calves with Strain 19 mantain their immunity for most, if not all, of their life. There is no advantage in giving booster injections at later dates. Adult stock may be vaccinated under special circumstances. For several reasons, however, it is much better to ensure that all of the female calf crop are vaccinated annually.

Brucellosis, or contagious abortion as it is commonly known, is due to a bacterium known as *Brucella abortus*. Infection is mainly picked up by stock eating contaminated pasture. In cold weather, pastures can remain contaminated up to three months. Therefore adopt hygienic measures when a cow aborts. The organism usually lodges in the womb and udder. Brucellosis results in calf loss, retention of afterbirth and often complete loss or reduction of the subsequent lactation. Furthermore, in cows that do not abort, udder infection may seriously decrease milk production.

If some abortions do occur in your herd despite Strain 19 vaccination, don't abandon vaccination. Rather, have the trouble investigated by your local Veterinary Officer or Stock Inspector. It is probable that another disease agent is responsible.

It has been proven without doubt that Strain 19 does not cause infertility in heifers. Vaccination is a worthwhile insurance that you cannot afford to be without. Your private veterinarian does Strain 19 vaccination rounds regularly and will include you on his list if you make arrangements with him. You cannot expect to get maximum production from your herd when brucellosis is not properly under control.

—*S. G. KNOTT, Divisional Veterinary Officer.*

Check Milking Machines Each Year.—Have the efficiency of your milking machine checked by the Agriculture Department at least once a year. Regular checks will detect minor faults before they become costly.

Milking machine testing is a free Agriculture Department service. All the farmer has to do is to approach his local dairy officer. This officer will arrange to make the test at some convenient time.

Milking machines usually get out of adjustment very slowly. Often a farmer has no idea that his machine is not efficient until the cups begin falling off or large amounts of strippings are left behind. Before this stage is reached, the machine, gradually getting further and further out of adjustment, may have caused a great deal of loss. Faulty machines can cause cows to dry off too soon through slow milking and may even cause mastitis.

You need not wait until the slack season to have your machine tested. Testing can be done between milkings and will not interfere with the normal milking programme. The dairy officer will make any minor adjustments on the spot, but major repairs, like reconditioning the vacuum pump, will have to be done by a milking machine company.

The equipment for testing milking machines is accurate and gives an impartial assessment of the machine's efficiency. Many farmers have already proved that it pays to have their machines tested each year.

—*J. D. ELRINGTON,*
Senior Adviser in Dairy Machinery.

Dairy Water Affects Cream Grades.—Cream grades are influenced strongly by the quantity and quality of the dairy water supply. Shortage of water can lead to inefficient cleaning, and poor quality water can cause scaly deposits to form on dairy equipment.

Rain water is recommended for dairy use. It's soft, and if stored properly, is free from harmful bacteria. Many wells and dams, however, also supply water suitable for the dairy.

At least 2,000 gallons of water should be stored at the dairy. This is more than a month's supply and will carry the farmer over a short dry spell. A few hours spent in repairing roofing and cleaning guttering could mean additional valuable water in your storage tanks later.

—*W. D. MITCHELL, Dairy Technologist.*

Soldering Cracked Seams in Can Lids.—It is no secret how hard it is to rid a can lid of fat in order to successfully solder and seal the cracked seam. This is easily done using a fat solvent similar to those used in dry cleaning.

This should be applied with a small paint brush to the area to be soldered and the inside of the lid thoroughly washed. It may be necessary to give several washes with the solvent to gain the desired result and washing should be continued until the solvent is clear.

It is then a simple matter for the home plumber to run solder around the seam. However, if bubbles persist in coming through the solder, further washing in solvent is necessary.

The use of motor spirit or kerosene in this operation is not recommended as both leave undesirable residues; from motor spirit a stain and from kerosene a bad taint.

Whatever the solvent used, the repaired lid should be cleansed after with a good detergent as used in general dairy cleansing.

—*A. R. BROWN, Dairy Officer.*

Using Chlorine Sterilizers.—Chlorine sterilizers are used to destroy bacteria that have entered the milking plant or equipment between milkings. These chemicals are not a substitute for boiling water or steam sterilization after milking.

In using a chlorine sterilizer, rinse the equipment with the chlorine preparation between 5 and 20 min. before milking starts. Don't flush the remains of the chlorine rinse off the machines with other water, but be sure all equipment is well drained before use. Run the solution into the milk vat, over the cooler and into the cans.

Follow the manufacturer's directions closely in mixing up the chlorine solution. Weak solutions are ineffective and over-strong solutions unnecessary. A concentration of 150 to 200 parts per million is satisfactory for sterilizing all dairy equipment.

—*A. MURRAY, Senior Dairy Adviser.*

Sire Surveys.—Many farmers complain that sire surveys reveal the value of a bull after it has been sold or is dead.

Unfortunately in many cases this is true, but, even so, the information obtained is still valuable. From an industry point of view it is important to know that bulls from certain strains are either raising or lowering production. This information allows farmers to select bulls from various strains or families within a herd. It is often found that bulls from one particular family raise production whilst those from a different family within the same herd are not so successful.

It is always advisable to buy a young bull as a replacement a few years before dispensing with the chief herd sire. The young bull can be used sparingly at an early age. If his daughters are recorded as soon as they come into production, an early assessment of his capabilities can be obtained and he can be retained or culled as the results warrant. By this method it is possible to limit the damage which a poor bull can do. His low-producing daughters can be sold and the higher-yielding older cows retained for breeding replacements.

The requirements for sire surveying are to have all the bull's daughters identified, and to production-record the whole herd.

—*S. E. PEGG, Senior Adviser, Herd Recording.*

Brushes for Dairy Cleaning.—Thorough brushing during washing up is an essential part of keeping your milking machine and other dairy equipment spotlessly clean. For this reason, selection of dairy brushware has an important bearing on the efficiency of dairy cleaning.

Brushes with nylon bristles are recommended for dairy use. These are fairly resistant to heat and to the chemicals usually contained in dairy cleansers. Nylon bristles are stiff, and recover quickly after bending. Stiff bristles also are less likely to become matted than pliable ones. A full set of dairy brushes should include a general purpose scrubbing brush, a milk dropper brush, claw tube brushes in two sizes, and a spout brush for separator spouts.

You can't expect to clean dairy equipment with worn or matted brushes. And remember, a dirty brush soils everything it touches.

—*J. Wilson, Dairy Officer.*

Herd Recording.—A farmer member of a Herd Recording Group on the Downs shows an impressive enthusiasm when discussing his herd and individual cows. He has been in the group long enough to begin to see the results of his culling programme and management reflected in production increases. He has lifted his average herd production from 210 lb. butterfat per cow in 1957-58 to 273 lb. butterfat per cow in 1958-59. Recording has given him an objective to aim for in production and he is building his farm programme around this.

Perhaps you may not have given sufficient consideration to joining a group. It costs 10s. to record each cow per lactation and this is equivalent to about 3 lb. of butterfat per cow per year. For this you have the actual production of each of your cows and can see the "boarders" and remove them.

With recording you do not guess at production but cull with certainty. Discuss recording with your Dairy Officer who will give any information that you desire and who can also arrange for you to be incorporated in a group.

—*S. W. IVERS, Adviser, Herd Recording.*

Mange in Pigs.—Sarcoptic mange could be a source of trouble in your piggery about this time. This skin complaint is more common in winter and spring, when the weather is dry and good green feed is scarce. One preventive spraying this month may well keep your piggery free of mange, and the discomfort and slow growth which accompany it.

This mange is caused by tiny mites which burrow under the pig's skin, and cause an intense itching. Affected pigs will keep rubbing against any solid object to obtain relief; sometimes they rub until patches of skin are scraped off.

If your pigs are constantly rubbing, and their skin is scaly, thickened, and cracking, or with raw areas, they probably have mange. Ask your veterinary officer or adviser in pig raising to take skin scrapings from the pigs to make sure.

You can clean up mange easily by spraying ALL pigs with a B.H.C. mixture, which should contain from 0·1 to 0·2 per cent. of the gamma isomer; a mixture two or three times the strength recommended for ticks on cattle will cure pig mange. Wet every pig thoroughly with the spray, and don't forget to spray floors and other places where the pigs lie. Repeat the sprayings at 10 to 14 day intervals until no signs of mange remain.

As mange is so readily eliminated by B.H.C. sprays it is surprising that it remains so common during the winter and spring months.

Can Fowls Run on Lawn Treated for Grass Grubs?—Many people have sprayed their lawns this summer and autumn to control grass grubs. The usual insecticide used for this purpose is DDT. Some people also keep fowls in their backyard and run them out onto the lawn for a "pick" just before dark.

A correspondent asks whether this practice is safe and whether grass grubs affected by the DDT would be poisonous to fowls eating them.

Lawns treated with DDT should be safe to fowls providing the spraying has been even. If one prefers to be cautious, the birds may be kept off the lawn for a week. The quantity of DDT taken in by the grubs would be extremely small and of no danger to the fowls. Slightly more DDT would be eaten with grass-shoots (a fowl could eat up to one quarter of an ounce of lawn clippings). But even here, the amount of DDT eaten would be very small. A further point is that DDT is less poisonous to animals than are other insecticides.

—*P. D. RANBY, Veterinary Officer.*

More Milk By Testing, Culling And Feeding

By A. R. BROWN, Dairy Officer

Mr. J. H. Fletcher, of Emu Vale, near Warwick, has raised the production of his 30-cow A.I.S. herd from 253 lb. of butterfat per cow in 1956 to 374 lb. in 1959. He attributes this increase to herd recording, culling and an improved feeding programme.

The farm of 164 acres is sub-divided into 13 paddocks ranging from 80 acres to 5 acres. About 12 acres are used for lucerne hay production and 14 acres for improved pasture. A further 20 acres are cultivated for maize and winter crops. The 80-acre paddock consists of native pasture on hillside country.

Dairying is the main source of income. Enough grain and fodder (baled lucerne hay) is produced on the farm to ensure sufficient feed for the herd. Some surplus is sold to defray expenses incurred at harvest time.

Establishment of Herd

Mr. Fletcher purchased his Emu Vale property in 1950. An 18-month-old A.I.S. registered bull, "Penrhos Showman", was purchased in 1951 and continuous herd recording commenced in 1955. Old cows with low production were culled. Some were replaced with registered animals which were bought from studs in the district. The rest were replaced with heifers bred on the farm.

"Penrhos Showman" was used until 1957. Many of the progeny of the pure bred replacements, mated to this bull, are the top producers on the farm today. The present herd sire is 4-year-old "Wenlock Bright Star."

Feeding Programme

A 5-acre paddock of irrigated improved pasture was established in 1954. This was grazed for the first time in the late spring of the same year. The area of irrigated improved pasture has since been increased to 14 acres. The pasture is a mixture of white and red clover, phalaris, cocksfoot and H1 ryegrass.

The amounts per acre of the various components of the improved pasture seed sowing are as follows:

	lb.
Perennial ryegrass	4
H1 ryegrass	2
Phalaris tuberosa	2
Cocksfoot	2
White clover	2
Red clover	1

The clovers are inoculated before sowing. Mr. Fletcher says it is wise to always plant more grass seed than clover. His suggestion is 1 lb. clover to 5 lb. grass seed.

These pastures are strip grazed with the aid of an electric fence. A back fence is used to prevent the stock grazing over the regrowth and freshly watered areas.

In addition to grazing on irrigated improved pastures, a 5 lb. mixture of lucerne chaff and grain is fed to each cow twice a day in the bails. All grain used in the feeding programme is home grown and is used at the rate of about 1½ bags a day. This grain is crushed or milled and a small proportion is fed to pigs. Mr. Fletcher considers that this bail-fed supplement, apart from balancing the ration, makes the cows more contented while they are being milked. In addition to the chaff-grain supplement, a bale of lucerne hay to every 10 cows is fed twice a day in the paddock.

The irrigated improved pastures provide the bulk of the feed from late July until the following April. During the frosty winter months these pastures enter a period of semi-dormancy and have to be spelled for longer periods. As most of the cows are dry in the early winter, all dry stock are kept on native grass and only the few remaining milkers are grazed in the pasture. The only fodder actually fed to the milking cows is lucerne (chaff and baled hay) and improved pastures.

Husbandry Practices

The herd is culled on the basis of (1) production, (2) temperament. As there are times when Mrs. Fletcher and the children milk the cows, temperament is an important factor in this herd. Any fractious animals are immediately culled, irrespective of production.

The following table will give an idea of how Mr. Fletcher has culled his herd with regard to production figures and cows' temperament. Some had injuries and were considered a nuisance in the herd.

TABLE 1

No.	Name	Reason for Culling	B/Fat (lb.)	Lactation (days)
8	Pansy II	Lack of production, bad temperament, short lactation	238	210
11	Sally . .	Bad temperament . .	349	300
12	Pansy I	Short lactation, bad temperament . .	248	210
14	Girlie . .	Bad temperament (kicker)	271	270
16	Joan . .	Badly cut teats—one quarter unsatisfactory as result	228	120
20	Plum . .	Mastitis	367	300
27	Rosie . .	Lack of production . .	182	180
34	Lily . .	Lack of production, short lactation . .	97	120
36	Meg . .	Lack of production, short lactation . .	174	210

These cows were culled during the 1958-59 season.

The reasons for culling in the 1957-58 season were mainly to prevent overstocking because of the drought conditions. Heifers are culled if they fail to produce at least 250 lb. butterfat in 270 days except in the case of sickness or injury, in which case the heifer is given another chance.

The level of production for culling has been increased according to the general rise in production throughout the herd.

The progress achieved in average cow production during the more recent years of recording is demonstrated:

TABLE 2

Year	No. of Cows	Milk (lb.)	Fat Test (%)	B/Fat (lb.)	Lactation (days)
1955–56 . .	19	6,246	4·1	253	221
1956–57 . .	35	7,274	3·9	283	252
1957–58 . .	34	7,150	4·1	291	277
1958–59 . .	26	9,406	4·0	374	285

The spectacular increase in per cow production from 1957-58 to 1958-59, that is, 291 lb. to 374 lb., occurred as a result of Mr. Fletcher's decision to reduce the stocking rate. Owing to heavy culling at the end of the 1958 season, instead of feeding 34 cows on 14 acres of improved pasture, 26 cows were fed on the same area of pasture. As the cows had more to eat they naturally produced more. It was possible to produce a similar total production, 9,724 lb. of butterfat compared with 9,874 lb. during the previous year, from approximately 25 per cent. fewer cows.

The herd sire is confined in a 3-acre bull paddock to ensure controlled mating and grazes on oats and sudan grass. He also gets a supplement of 20 to 30 lb. of hay a day.

The cows are mated to calve in June and July each year. Twenty-five of a total calving of 42 were dropped in this June-July period, the remaining 17 being born either a month prior to or after this two-month period. This is the period when the irrigated improved pastures are emerging from their winter rest period thus providing ideal feeding conditions for fresh cows.

Mr. Fletcher considers that by testing, culling, selecting and improving his feeding programme he has:

(1) increased the period of lactation from 221 days in 1956 to 285 days in 1959,

(2) raised his production from 253 lb. butterfat per cow in 1956 to 374 lb. in 1959—an increase of 121 lb. fat.

Breed For Better Egg Shells

By B. W. MOFFATT, Poultry Adviser.

Hatcherymen can gain by breeding to improve the quality of egg shells. Two ways of testing egg shells are described:

Every year the poultry industry loses thousands of pounds through eggs being broken before they reach the consumer. The average farmer would probably be surprised at his own loss from cracked and broken eggs if records were kept even for a short period. Some of this loss can be prevented by ensuring that the birds' ration contains adequate amounts of vitamin D3, calcium, phosphorus and manganese.

However, from trials carried out at the Poultry Section of the Rocklea Animal Husbandry Research Farm, it is becoming evident that this egg shell problem may be largely a breeders' problem. This explains why some farmers still have trouble with poor shell quality, even though their rations are properly balanced. If a strain of fowls has an inherited tendency to lay thin-shelled eggs, then no matter how good the ration and mineral supplements these fowls cannot produce eggs with sound shells.

Fortunately it is not a difficult matter to improve egg shells by breeding. The work involved is not great and progress can be rapid. On the hatchery where single testing is not carried out, the hatcheryman cannot expect progress to be quite so rapid as on a properly organised breeding farm, but he can still obtain reasonable reward for his efforts.

What Is Involved?

In most hatcheries a good deal of selection is carried out on eggs before they are incubated. This is done by setting only those eggs that are regular in shape, of standard weight and free from obvious shell defects. Improving egg shell quality involves taking this selection just one step further. It involves the use of an efficient method of detecting thin shells.

There are two methods available. The first method is not practicable on a hatchery, but is used overseas on many of the large breeding establishments where individual birds are scored for internal quality in addition to shell quality. Using this method a number of eggs from each bird are broken out and the thickness of shell is measured with a paper gauge to within one-thousandth of an inch. See Plate 1.

The second method does not involve the breaking out of eggs and can be used where single testing is not carried out. This method is

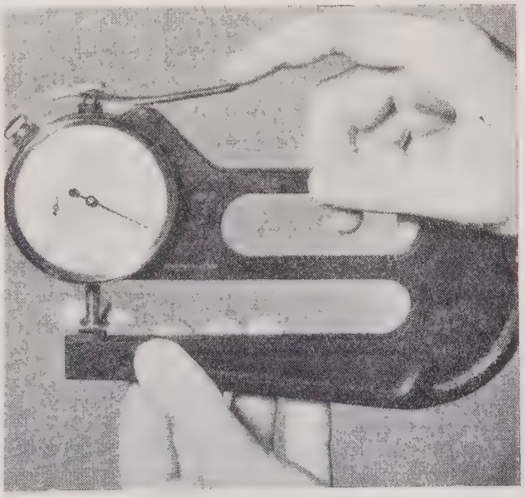

PLATE 1

This Paper Gauge Will Measure Shell Thickness Satisfactorily But the Eggs Have to be Broken Out.

based on the fact that the specific gravity* of a fresh egg is very closely related to the thickness of shell. This therefore provides a very efficient but extremely simple means of finding shell thickness and no calculations are involved.

The Specific Gravity Method

To find the specific gravity, the eggs are immersed in a solution of common salt and water of a certain concentration. Some of the eggs will float and others will sink. By altering the strength of the salt solution any percentage of eggs can be made to float. The eggs that float will have thinner shells than those that sink. There is one exception. Eggs that have porous shells, although these shells may be relatively thick, will float. As porous shells give poor hatchability, because of loss of water through the shell it is an advantage to have these eggs float. Detecting thin shells therefore becomes an easy task. All that has to be done is to make a salt solution of a certain strength and immerse all eggs in this solution when they are fresh. The eggs that float are rejected as having thin or porous shells and the ones that sink are selected for hatching. The task is simplified even more by carrying out this test only on eggs that are required to produce replacement breeding chickens. The chicken customer will eventually benefit if the hatcheryman improves his own breeding flock in this regard.

The Salt Solution

The strength of the salt solution is the key to the whole procedure. It is determined only by the percentage of eggs the hatcheryman can afford to reject. It will vary from flock to flock depending on the present standard of shells.

It is generally considered that eggs with shells less than about fourteen-thousandths of an inch are likely to crack in transit to market or when being handled. The hatcheryman should therefore aim to eliminate as many of these eggs as possible.

It has been determined that a salt solution of specific gravity 1·080 will float eggs with a shell thickness of less than fourteen-thousandths of an inch. If possible, therefore, a solution of similar strength or stronger should be used. This strength can be obtained by adding 19 oz. of salt to 1 gal. of water. A large glass container is ideal for this work. The eggs are visible through the walls of the container and the glass is not affected by the salt.

The strength of the salt solution is easily measured by means of a specific gravity hydrometer. A suitable hydrometer with a range of 1·050 to 1·100 can be purchased for less than £1 from a laboratory equipment firm. To obtain a specific gravity of 1·080 salt is dissolved in the water until the hydrometer floats with the 1·080 mark level with the surface of the water.

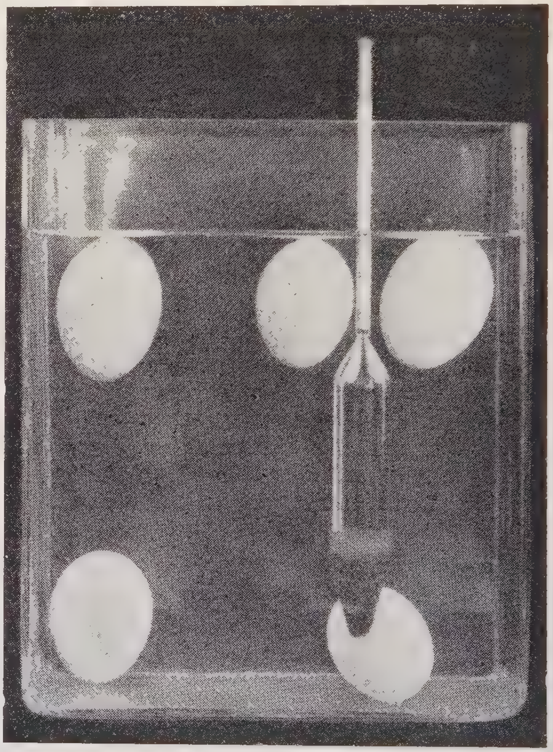

PLATE 2

The Specific Gravity of the Salt Solution can be Measured with a Hydrometer. In this solution (S.G. 1.080) the eggs floating have a shell thickness of less than .014 in.

See Plate 2. If the solution is being kept from day to day, then the specific gravity should be checked before use and after every one hundred eggs have been immersed in it. There are just a few points that need careful consideration:

---

* *The specific gravity of an egg is the number of times heavier it is than an equal volume of water. The average specific gravity of eggs is* 1.090.

1. Check that all the salt has been dissolved before the specific gravity is read.

2. Ensure that no air bubbles are adhering to the shell as these may cause the egg to float.

3. Do not immerse too many eggs at once or some with thin shells may be carried to the bottom.

4. Check the specific gravity at intervals and adjust the solution to the original value.

5. Test only fresh eggs. As an egg ages, its air cell increases and this might cause it to float. If eggs are set weekly this test should be carried out on eggs not older than 3 days.

On The Breeding Farm

Where birds are being singly tested then the procedure can be carried one step further. Individual birds can be scored for shell quality by testing a number of eggs from each bird. Those birds with a high percentage of eggs that float are then rejected from the breeding pens. The strength of the salt solution can be increased from year to year as progress is made.

This procedure will give slightly more rapid progress than can be obtained on a hatchery where no breeding plan is in operation.

What Standard Are Your Birds?

In a recent test conducted at the Rocklea Animal Husbandry Research Farm, 16 different strains of fowls were tested for shell quality by the specific gravity method. The percentage of eggs that floated in each strain varied from 12·2 per cent. to 52·5 per cent. The average was 30·76 per cent. This indicated that there is great variation between strains in shell quality.

By applying selection for this character, the hatcheryman has much to gain. His hatchability should increase and his losses from cracks and breakages of eggs will be much reduced. Also he will have confidence in the stock he sells and his reward will be a satisfied customer.

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Holmes, L., "Benbecula", Yarranlea
Mathie, E. & Son, "Ainslie", Maleny
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Fletcher, A. B., "Cossart Vale", Boonah
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Lau, J. F., "Rosallen", Goombungee, Toowoomba
Matthews. E. A., "Yarradale", Yarraman
McCarthy, J. S., "Glen Erin", Greenmount, Toowoomba
Meier, L. E., "Ardath Stud", Boonah
Noone, A. M. & L. J., "Winbirra", Mt. Esk Pocket
Porter, F., Conondale
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Scott, Est. J. A., "Kiaora", Manumbar Rd., Nanango
Semgreen, A. L., "Tecoma", Coolabunia
Seymour, B. T., "Upwell" Jersey Stud, Mulgildie
Smith, J. A. & E. E., "Heatherlea" Jersey Stud, Chinchilla
Tatnell, W. T., Cedar Pocket, via Gympie
Toowoomba Mental Hospital, Willowburn
Verrall, F. W., "Coleburn", Walloon
Weldon Brothers, "Gleneden" Jersey Stud, Upper Yarraman

Poll Hereford

Anderson, J. H. & Sons, "Inverary", Yandilla
Hutton, D. R. & M. E., "Bellgrath", Cunningham, via Warwick
Maller, W., "Bore View", Pickanjinnie
Maller, W., "Bore View", Gowrie Junction
McCamley, E. W. G., "Eulogie Park", Dululu
Wilson & McDouall, Calliope Station, Calliope

Poll Shorthorn

Leonard, W. & Sons, Welltown, Goondiwindi

Taking The Stress Out Of Poultry Farming

By **A. H. OUTRIDGE,** *Poultry Adviser.*

Stress factors in relation to the keeping of poultry may be classed broadly under such headings as genetic, nutritional, disease, climatic, and others.

These stress factors may also be viewed as agents or allies which, with an infectious or non-infectious agent that may also be present, can act together to depress growth and production and often help to precipitate disease.

Some factors are related to management and in particular to the personal factor. For example, some dogs of a litter may be friendly, docile and happy beings in one home, whereas their litter mates in another home may grow into savage or irritable animals.

The good stockman and poultry farmer moves amongst his birds in an easy and friendly frame of mind that produces a similar and desirable state in his birds from day-old onwards.

Such men also seem to have the gift of a sixth sense that gives an instant warning when troubles first appear within their poultry flock. They are thus able to take immediate action to determine the cause and remedy it.

Usually, a healthy bird can adjust to a single, or even more than one stress factor. It is, however, the sum of all stress factors that determines whether or not there will be an upset in the flock. So the placing of a minor stress perhaps unwittingly on the birds may be the "last straw that breaks the camel's back."

There is a well-known saying that a good farmer could get better results from an average flock than a poor farmer from birds of better breeding.

Thus, management is a key factor in the profit picture of a flock, and management includes the reduction of stresses to which birds are subjected at any time during their lives.

Some Things A Farmer Can Do

Rough treatment at the day-old stage places a stress on healthy chicks right from the start. A delay in getting chickens to eat and drink is another. Let these youngsters get overheated or chilled once during the brooding stage and again they are faced with a third factor that may cause troubles.

Faulty ventilation is another stress, no matter what the age of the birds. The alert farmer can notice weather changes and go quietly about any necessary adjustments.

In the matter of climatic stresses, the poultry man of course has no direct control over weather changes and the extremes of temperature that can upset his flock. He can, however, provide well-designed sheds on a site suitable for poultry. The farmer who plans and builds for ample ventilation, paints galvanised roofs and walls white or uses fibro cement for roofing material and the walls of his sheds, together with the provision of spray systems, protects his birds in hot weather and increases his returns.

Inadequate feed and watering space can really put a stress upon the flock. Let the birds run out of water for an hour or two on a hot day and it will do more damage than a six-hour break without food.

The careful farmer who makes available 30 lineal feet of feeding space, together with 6 lineal feet of watering space or 15 drinking nipples to 100 adult birds, removes quite a stress from his flock.

The shock and fright that could result from a farmer's charging up to a shed full of his birds and dropping a load of timber or a bag of feed is a stress that can be so easily avoided.

A Question of Management

Wet and caked litter, a change in routine, competition at the waterers and feed troughs and lack of perching space are all stress factors. Their removal is a question of management.

Insanitary conditions are the breeding grounds of disease stresses. An efficient sanitation programme that employs plenty of elbow grease can throw a spanner into the life cycle of a host of disease agents that can attack poultry.

The farmer who adheres to routine in the matter of sanitation, rat-proofs his farm, cleans out waterers regularly and removes dust and cobwebs from his sheds, transfers the stress from the poultry to the many disease agents by depriving them of the dirty conditions they like to thrive in.

Overcrowding of poultry loads a particularly vicious stress on the flock. This fault in management does not pay at any time and, sooner or later, nature cuts the flock down to size.

Worms, lice and mites and the treatment for these are other stresses. The flock should be handled quietly with as little disturbance to the birds as possible.

Internal parasites such as round worms can build up unnoticed in a flock and rob the birds of valuable nutrients. When present in sufficient numbers, the poisons excreted internally by these parasites can affect the birds' health. External parasites can also worry and depress the vitality of the flock.

The farmer who adheres to a routine for the eradication of these parasites can prevent a stress building up in his flock that too often goes unseen.

A badly balanced or inadequate ration is as severe a stress as any flock can face up to. Poor rations mean poor returns for the farmer.

In this matter of stress, anything away from the ordinary is of real importance to the poultry flock. Yet it may pass unnoticed by the farmer in the bustle and work of every day.

Being kind to ones poultry flock and preventing any undue strain on the birds means a happier, healthier and more profitable flock that is a tribute to its owner's care and management.

* * *

Botany For Farmers

Although compiled in the first place for beekeepers, "The Honey Flora of South-Eastern Queensland" has a use for farmers and others interested in botany. It contains illustrations and descriptions of the important ironbarks, gums, bloodwoods, boxes, stringybarks, wattles, tea-trees, and cultivated plants such as lucerne, pumpkins, oranges and clover.

"The Honey Flora of South-Eastern Queensland" contains 199 pages and 178 illustrations. Prices are: In Queensland 15s. a copy, with a 3s. discount to registered apiarists, University botany students and booksellers; elsewhere £1 a copy.

Stock and Station

Hormones for Cattle.—Several graziers have inquired recently about the use of hormones for fattening cattle on native pastures. The hormone is prepared in tablet form and implanted under the skin at the back of the ear. The Department has made observations and recorded weight gains on hundreds of treated cattle and these comments are based on those results:

The hormones which are used for fattening cattle are not a food and they don't replace a foodstuff. In effect they divert the food nutrients from fat production to muscle or meat production. This effect lasts for up to 5 months but reaches a peak at just over 3 months from implantation. Fattening stock which have plenty of good quality feed available to them for up to 5 months after implantation are likely to gain more weight than untreated stock.

Trials have shown an average of about 20 pounds extra weight in favour of implanted stock. To get the benefit you need fattening stock, plenty of good feed for them and a turn-off within 5 months. Only male slaughter stock should be treated. Hormone treatment won't start the fattening process. It may well prove a disadvantage if you can't be sure of having plenty of feed to carry the cattle until they are fit for slaughter 3 to 5 months after implantation.

—*W. MAWSON,*
Senior Adviser in Cattle Husbandry.

Fertilized Green Panic Pastures.—Fertilizers containing nitrogen and sulphur have increased yields from green panic pastures at Gayndah by more than half a ton an acre in eight weeks. This response was obtained in fertilizer trials at the Brian Pastures Research Station.

In 1958 and 1959, pastures were fertilized in March in an attempt to lengthen the growing season and to provide high quality feed in times of shortage. Results have been surprising.

Nitrogen was applied at eight rates up to 460 lb. of urea to the acre. Greatest increase in growth for each 1 lb. of urea applied came from a dressing of 65 lb. of urea to the acre.

Eight weeks after treatment with 65 lb. of urea to the acre, the pasture produced an additional 900 lb. of dry material an acre in 1958, and 1,500 lb. in 1959. From light fertilizer dressings the response lasted six months, but big dressings gave increased growth 12 months later.

On this basaltic forest soil, pastures responded to sulphur if nitrogen was applied as well, and nitrogen, too, gave much better results with sulphur. The yield increased by 50 per cent. after sulphur had been applied at 20 lb. to the acre.

A feature of the trials was the failure of the native grass species to respond to fertilizer. In a sown pasture paddock, the proportion of green panic to native pasture increases substantially after nitrogen and sulphur have been applied.

When pasture growth slackens off the cause is usually thought to be unfavourable weather, but often the cause is really a shortage of nitrogen. The responses recorded at Brian Pastures were obtained in years of below-average autumn rainfall. This provides further evidence that nitrogen, either from legumes or out of bags, could prolong the productive season of sown pastures.

—*W. J. S. SLOAN, Director of Plant Industry.*

"Hobby" Plots.—Small pasture "hobby" plots on sheep and cattle properties in Western Queensland are helping to increase large-scale sowings of improved pastures.

They are an Agriculture Department move to give graziers pasture demonstrations on their own properties. As well as showing the merits of various commercially available pasture plants and promising species, the plots also give graziers experience in establishing and managing improved pastures.

Altogether, 44 of these plots have been established between Toowoomba and Quilpie in the last three years. They have been put down in the Millmerran, Quilpie, Maranoa, and Warrego districts under the guidance of Mr. R. G. Wilson, an Adviser in Agriculture at Toowoomba, who initiated the scheme. Similar-type plots have been established in the south-west by Mr. W. Bott, Experimentalist, of Goondiwindi; and more recently in the Gulf by Mr. I. Sillar, Agrostologist, of Cloncurry.

A recent survey of the 44 plots under the supervision of Mr. Wilson has shown that half have now been in progress for a sufficient time to make an assessment of their value. Of these, 15 have been successful and landholders have followed up the promising demonstrations with larger plantings.

The plots have indicated that buffel grass and even green panic, blue panic and Rhodes grass had a place on the various soil types in these areas. Observations show that in the drier Maranoa-Warrego area, successful establishment depends largely on timely rains, cool weather and good soil structure rather than on fertility.

Results of the hobby plots so far are encouraging. The plots are cheap, simple and informative, and the landholder can become interested in the performance of different pasture plants on his own land. At the same time, performance of the various pasture plants on a range of soil types can be assessed. If the grazier decides to make any large-scale plantings he can choose the species he has found to be most suitable for his particular property.

The fact that graziers were already expanding these plots into larger plantings was proof of their value.

Poisonous Plants Kill Stock.—Poisonous plants continue to take their annual toll of stock in Queensland, and it has been reported that, of the numerous specimens tested by the Poison Plants Committee, no fewer than 26 different species of plants have been proved by feeding experiments to be toxic.

In some cases the poisonous principles have been determined and these include prussic acid, oxalate, nitrate and certain alkaloids.

Two disease conditions of stock suspected of being caused by poisonous plants are under special investigation in Queensland at the present time.

The first, which manifests itself as either a heart condition or a skeletal malformation, is thought to be caused by blue parsnip (*Trachymene glaucifolia*) although feeding trials to date have not yielded conclusive results.

The second condition is a blindness in sheep that occurs on certain holdings in the Maranoa district. Goats are also affected although horses and cattle do not appear to be susceptible. The disease occurs in April and May and the lesions appear to be restricted to the nerves of the eyes.

Melioidosis—A Tropical Disease.—Melioidosis is a tropical disease which for many years was known chiefly as a fatal disease of man in south-east Asia. It was first recorded in Queensland in 1949 in an outbreak in sheep in the central western area of the State. Since that date five further outbreaks have occurred among sheep, and work carried out at the Animal Health Station at Oonoonba near Townsville has shown that the disease also occurs in goats, pigs, cattle and horses.

Symptoms are mainly loss of appetite, fever, difficulty in breathing, coughing, discharges from eye and nose, loss of condition and lameness due to arthritis. Wet conditions appear to favour an outbreak.

As a result of four years' work at Oonoonba Animal Health Station, research workers have now developed a diagnostic test to the stage where it can be used under field conditions. Success in this will mark yet another step forward in man's conquest of disease.

New Disease in Pigs.—What appears to be the first authentic case recorded in Australia of oedema disease in pigs occurred recently on a south-coast property in Queensland.

The outbreak occurred on the property shortly after it had changed ownership. The new owner bought 25 pigs from six to eight weeks of age at a saleyards and these brought the total number of pigs on the property under four months of age to 40 head.

Trouble started a week after the introduction of the new pigs and some 12 animals were lost; four in one day. Pigs that appeared quite healthy in the morning dropped dead a few hours later.

A post mortem examination of one pig revealed, among other symptoms, that the membrane between the coils of the large intestine was full of fluid and in places gelatinous. Bacteriologists at the Animal Research Institute, Yeerongpilly, recovered a bacterium (*haemolytic Escherichia coli*) that was considered to be the cause of the condition.

The disease mainly affects young pigs in the post-weaning period; owners suspecting the presence of this ailment in their herd should contact the nearest veterinary officer as soon as possible.

Irrigated Pastures For Southern Darling Downs

By G. R. LEE
and A. G. MARTIN, Agriculture Branch.

For those who are interested in growing irrigated pastures within the boundaries of the southern Darling Downs, the recommendations in this article will prove valuable:

Active interest in irrigated pastures is increasing in the southern Darling Downs. Some 300 acres of highly productive irrigated pastures are now grown in this region. These are located mainly on fertile soils close to watercourses and in areas where an assured supply of good quality underground water is available. Along the Condamine River and tributaries there is still ample scope for the planting of irrigated pastures and the present area may well be doubled in the near future, using water harvesting techniques and surface irrigation methods.

A very large increase in acreage of irrigated pastures could be expected if the proposed Sandy Creek dam is constructed.

Irrigated pastures are a long-term asset and the initial cost of establishment is not excessive when we consider the productive life, which may vary from 6 to 10 years. To obtain a nutritious, balanced pasture over this period, establishment and management must be carried out efficiently. Before establishing an irrigated pasture it is necessary to decide which method of irrigation will be adopted.

METHODS OF IRRIGATION

Both spray (sprinkler) and surface (flood) irrigation are used in this district to irrigate pastures. Until recently, spray irrigation was used almost exclusively, but both border strip and contour ditch irrigation are now rapidly gaining in popularity where suitable water supplies and soil types exist.

There is a large area of land suitable for border strip irrigation on the southern Darling Downs, the limiting factor being the lack of suitable water facilities. Border irrigation is at present confined mainly to properties adjacent to the Condamine River, properties possessing water harvesting facilities, or those having subartesian bores with a capacity about 10,000 gallons per hour. Some small farm projects will, however, be supplied from bores of only half this capacity. The larger capacity is to be desired as watering can be carried out more quickly and therefore larger acreages can be handled more efficiently.

Spray Irrigation

Portable spray plants are in general use on the smaller streams and on low capacity bores where the water supply is limited. They are also used on land that is unsuitable for flood irrigation such as porous sandy soils and very uneven areas.

The type of irrigation plant used varies from low pressure sprinkler to high pressure spray units. Most of these plants have been designed for portability, one automatic rainline being self-propelled.

All of these units share the disadvantages of high initial cost coupled with a high evaporation rate during hot dry summer months. With most of these plants the labour involved in shifting and setting up spray lines is considerable.

For these reasons, many district farmers who possess suitable land and have access to adequate water facilities are now either in the process of preparing for border irrigated pastures or they are already irrigating by the border method.

Border Strip Irrigation

Briefly, this method of surface irrigation involves the application of water to borders which are separated by earthen check banks spaced 22 to 33 ft. apart.

The water is pumped to a head ditch which conveys it to the top of the area to be irrigated. Gates or outlet boxes are installed in the head ditch bank to regulate the flow of water into individual borders. These outlets are constructed with metal slides to regulate or close off the water supply as needed. Siphon tubes of plastic may also be used to deliver water from the head ditch. The borders are designed so that they run with the fall of the land; the fall or slope from the head ditch to the far end where a tail drain is located may vary from 2 in. to 2 ft. per chain. Care is needed to control water flow on the steeper grades.

When the water enters the bay on land that has been properly prepared, it spreads out from one check bank to the other and flows down the bay wetting the soil as it goes. During periods of high summer rainfall, excess water is carried off the area by the tail drain.

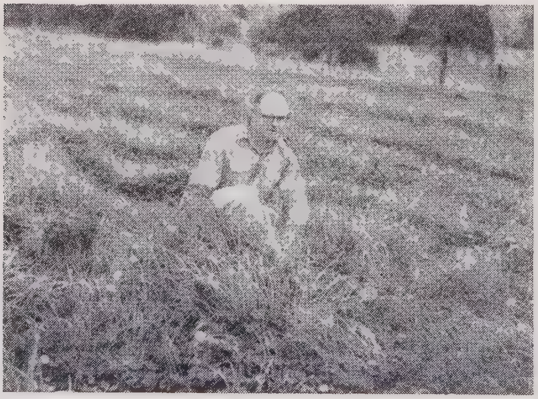


Plate 1

A Lush Irrigated Pasture on Messrs. T. G. & L. M. Matthews' Goomburra Property.

A relatively heavy clay soil such as the black soils of the southern Darling Downs is ideal for border strip irrigation, and farmers with little experience in irrigation have the minimum of difficulty in obtaining an even distribution of the water. These soils, with natural rainfall supplemented by an extra 24 in. of water applied annually, are capable of maintaining production of 35 to 40 tons of highly nutritious pasture an acre a year.

Before land can be developed for border strip irrigation it is necessary to select an area of suitable topography and suitable soil type. This area can then be surveyed on a grid pattern so that spot heights can be obtained every chain. This will enable a contour plan to be prepared on which a suitable design can then be imposed. Such a plan is essential for subsequent land preparation. It enables levelling to be carried out efficiently and the location of head ditches, tail drains and check banks is simplified. The surveying may be carried out by officers of the Department of Agriculture and Stock or of the Irrigation and Water Supply Commission.

Land Preparation for Border Strip Irrigation.—During late winter the land should be ploughed to a depth of 5 to 6 in., ploughing being carried out in the direction of the slope, that is at right angles to the contour lines which appear on the farm plan. The soil can then be worked with tine and disc implements followed by harrows to produce a fine tilth. The land should be levelled before the commencement of summer rains using a land leveller.

The Department of Agriculture and Stock has an automatic land leveller working in the Warwick district. This machine is made available to farmers free of charge to assist with the development of land for surface irrigation. The leveller can be pulled by a medium horse-power tractor and will level land very quickly and efficiently. It can also be adjusted to construct the check banks.

The first grading is carried out down the slope after serious irregularities have been corrected.

The soil can be brought to a fine tilth using tine or disc implements and harrows. The check banks are then marked in with a light plough. Cross grading is now carried out, depositing soil on the site of each check bank. The check banks are then crowded using either a wooden crowde or the modified land leveller with crowder attachment. A light grading can then be given each bay by running the leveller up and down the bay parallel to the check banks, thus correcting slight irregularities in sidefall.

On most land prepared for border strip irrigation in this district, land preparation has been very straight-forward and the cost very low.

It is emphasised, however, that the soil must be worked to a fine tilth to facilitate levelling. Rain during this latter period can compact the soil and make it difficult to grade for the construction of check banks. Another working would therefore be necessary under such circumstances.

Tail Drain. The tail drain is normally constructed early during the preparation of the land for levelling and the soil removed can be graded into any low spots.

Head Ditch. The head ditch is constructed last using a two or three furrow disc or mouldboard plough to remove most of the soil, this being followed by a delver to clean out the remaining soil and give the ditch its final shaping. A wide shallow ditch is to be preferred, the size depending on the volume of water to be handled. The head ditch is constructed from the point of delivery of water to the area to be irrigated and it runs across the high end of the bays.

When irrigating, temporary (bag or canvas) or permanent checks are used in the head ditch to bank the water up above the level of the outlet boxes. The outlet boxes, which are constructed of 6 in. x 1 in. hardwood, are imbedded in the side of the ditch, one to each bay.

Precropping is Desirable. It is advisable to grow an annual crop on newly graded land before attempting the final seedbed preparation.

This is necessary to correct unevenness of soil fertility caused by movement of soil in the grading operations. Precropping will help in developing uniform fertility and will improve soil structure.

Growing an annual crop after grading will also give the filled areas a chance to settle before planting permanent pasture. After the crop has been grazed and ploughed in, the land should be given a light corrective grading to remove any small depressions caused by settling of the filled areas. If the corrective grading is neglected, inefficient and wasteful use of water must follow.

Planting the Pasture. Planting can usually be carried out using a combine after the final corrective grading without cultivation. It is sometimes desirable, however, to give a last shallow cultivation to produce a suitable seedbed following the final grading. Such a cultivation would be carried out between the check banks running with the direction of fall so as not to damage the check banks unnecessarily.

The planting machinery is operated across the borders on most areas to improve the spread of water later on. On land possessing very little fall the planting is carried out with the slope so that the water will travel down the bays satisfactorily.

Contour Ditch Irrigation

The highly successful contour ditch method of flood irrigation was introduced to Queensland by Mr. A. Nagle, Irrigationist with the Department of Agriculture and Stock. This system has enabled farmers to successfully flood irrigate country possessing a slope between 3 and 10 per cent. Contour ditch irrigation is not expensive and it saves labour. It offers great scope to farmers and graziers in this district.

As with border strip irrigation, pumping cost is only two-thirds that of spray irrigation. Little levelling is required for this system and the ditches and spreader furrows can be easily constructed using a light tractor and double furrow mouldboard plough.

Water is either pumped from a bore, river or dam, or, alternatively, gravity-fed from a storage dam above the area. The contour ditches have a slight fall and carry the water across the slope. By means of checks in the ditch the water can be banked back along the ditch enabling it to flow down the slope by opening up the wooden outlet boxes. These outlet boxes are similar to those used with border strip irrigation and they are normally spaced 11 yd. apart along the ditch.

Land Preparation. Before ploughing, it is usual to have an officer of the Department of Agriculture and Stock survey the contour ditches and, if necessary, a diversion bank should be constructed above the area to be treated.

The land can then be cultivated parallel to the ditches, finishing out in the middle of each bay. The contour ditches should also be constructed as they will then provide some protection to the cultivated land. In constructing the ditch, approximately 6 furrows are ploughed throwing the soil downhill. The soil from the top four furrows is then worked down onto the bottom furrows to give a wide shallow ditch and a well-compacted bank on the lower side. The ditch is finished off with a delver.

Precropping. Where the risk of soil erosion can be overcome and where soil structure will not suffer, it is desirable to carry out precropping before laying down the pasture.

In most cases the sloping soils used for contour irrigation are less fertile than the heavy soils on the flats. The growing of a fodder crop including annual legumes will result in a considerable increase in soil fertility which will give quicker pasture establishment.

Planting. During early autumn a fine seedbed can be prepared and a light levelling can be carried out working parallel to the ditches.

Planting is carried out working on the contour. When the pasture is sufficiently well established spreader furrows can be surveyed and ploughed in. These furrows follow the true contour and are so placed that they spread the water laterally as it moves down the slope. The first furrow is spaced only 3 ft. from the contour ditch and the remainder 15 to 20 ft. apart. They are ploughed in with a single or double furrow plough, the soil being thrown up the slope. These spreader furrows soon grass over again and do a very effective job. The pasture is usually established under natural rainfall, the first contour irrigation being carried out when the pasture has given sufficient cover to the soil.

Plate 2

A Newly Established 7-Acre Flood Irrigation Project on Mr. S. Nicholson's Property, Murray's Bridge; Border Strip on the Left and Contour Ditch Irrigation on the Sloping Country to the Right of the Head Ditch. Note the broad shallow ditch.

Technical Advice and Surveys

The Irrigation and Water Supply Commission provide an advisory service for farmers and are responsible for the administration of the Farm Water Supplies Assistance Act.

Advances under this scheme are made to farmers for the construction of storage dams and sinking of bores for irrigation; also for the purchase of irrigation and pumping plants. Designs for these works are also provided.

The Irrigation and Water Supply Commission exercise control over pumping of water from streams and a license must be obtained before irrigation from a stream can be commenced.

Technical advice on suitable soils, pasture mixtures and management is available from officers of the Department of Agriculture and Stock. Surveys for border strip and contour ditch flood irrigation are carried out free of charge by this Department.

Establishment and Management

Pasture Planting.—Thorough seedbed preparation is necessary in order to produce a weed-free seedbed with a fine surface tilth. Levelling of the paddock is rather important even for spray irrigation systems so that full benefit from the irrigation water will be obtained. The best planting time is from March to early May. However, later sowings until August have usually been quite successful. Rain falling after planting ensures good germination. In the event of dry weather, the pasture can be planted into dry soil which is then spray irrigated. If border strip irrigation is being used, the area may be watered before planting under certain conditions, for example, when soil moisture is inadequate following a dry autumn. This will enable weed seeds to germinate and be controlled at the time of planting.

A small-seeds box mounted on a drill or combine is ideal for pasture planting. The depth of the machine is adjusted to place the seed about ½ to 1 in. under the soil surface. However, broadcasting and covering by harrows is usually quite satisfactory. Some modern combines which have a reduction gear attachment for the grain box dispense with the need for a small-seeds box.

Seeds Mixture.—The choice of suitable pasture species is of much importance and is governed to an extent by the availability of water.

1. Recommendation for limited water supplies:

Lucerne 2 lb. to the acre.

Priebe's Perennial Prairie grass 10-12 lb. to the acre.

This mixture has proved to be capable of heavy production and is able to withstand prolonged dry spells when irrigation water may be unavailable.

2. Pasture mixtures recommended for the southern Darling Downs district where adequate water supplies are available:

		Per acre
(*a*)	Irrigation White Clover, Ladino White Clover	1 lb.
	Phalaris tuberosa, Phalaris arundinacea	1½ lb.
	H.1. Ryegrass	2–3 lb.
	Perennial Prairie Grass . .	2 lb.
(*b*)	Irrigation White Clover, Ladino White Clover	1 lb.
	Phalaris tuberosa, Cocksfoot . .	3 lb.
	H.1. or Perennial Ryegrass . .	2–3 lb.

Production from these mixtures has been outstanding, but it is essential that an efficient watering schedule be adhered to.

Management.—The young pasture must be permitted to establish itself properly before grazing is commenced. From a March sowing, grazing is usually possible within 10 weeks, but this time may extend to 12-14 weeks with a later sowing.

If grazing dairy cows, maximum feed utilization is invariably obtained when an electric fence is used.

Heavy grazing is possible during the spring months, this time corresponding to the period of heaviest pasture production. Grazing should be adjusted in order to maintain a good ground cover at all times. This is of particular importance during the summer in reducing the temperature of the soil surface.

Temperatures of 130 deg. on bare ground are not uncommon and considerable harm to the pasture species can result. The maintenance of a ground cover will reduce the soil surface temperature by as much as 30 deg.

Spelling of the paddock during late summer and early autumn is advisable, following which grazing during the winter months is then possible.

District pastures have maintained an annual production of 35 tons of green material to the acre for several years.

Drastic renovation of irrigated pastures is unnecessary and often quite harmful. The prairie grass mixture might respond to light scarifying early in the season to promote seedling regeneration, but this is only necessary if the grass component is diminishing. Such a renovation would do more harm than good to the white clover mixture and the light renovation resulting from the use of pasture harrows for manure spreading is quite sufficient.

Motor car tyres, cut in half around the tread and fastened cut side down to a drawbar, have proved to be cheap and efficient for manure spreading.

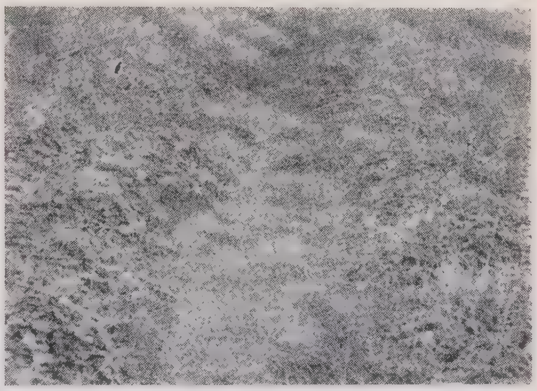


Plate 3

Response to a Mixed Nitrogen/Phosphorus Fertilizer is Demonstrated on Messrs. T. G. & L. M. Matthews' Pasture. Either side of untreated strip was fertilized at the rate of 187 lb. per acre.

The use of fertilizers is important on the lighter soils of the district. In these cases, dressings with superphosphate or even mixed fertilizer containing nitrogen can be of considerable value. Superphosphate is best applied at planting time at a rate of approximately 1 cwt. per acre (Plate 3).

If using a nitrogenous fertilizer to promote rapid grass growth, it should be topdressed onto the established pasture. If applied at planting time, establishment of the legume portion could be adversely affected.

There is evidence suggesting that applications of potash could be beneficial. However, this work is still in the experimental stage and a firm recommendation cannot yet be made.

QUALITY OF IRRIGATION WATER

The quality of irrigation water is of extreme importance where the water is obtained from an underground supply. An excessive salt content will result in rapid deterioration of the pasture, and, consequently, samples of water should be analysed before commencing an irrigation project. The analysis is carried out by the Department of Agriculture and Stock in Brisbane.

WATER APPLICATION

The greatest limiting factor to pasture production is insufficient watering, so it is essential that efficient irrigation practice be adopted and adhered to. During hot dry weather it could be necessary to irrigate every 12 to 14 days in order to maintain a satisfactory level of moisture in the root zone. A soil auger is of considerable value in determining when it is necessary to irrigate, and a soil probe to determine when to cease watering. For pastures the soil should be wet to a depth of about 2 ft. This can be achieved by application of 2 to 3 in. of water, the quantity depending on soil type.

During the cooler weather, applications can be lighter and less frequent because evaporation and transpiration are at a minimum. As the weather becomes warmer, heavier and more frequent watering is required to offset this moisture loss.

Because the pastures are dormant from mid- to late summer, a frequent mistake is to stop watering during that period. This can result in loss of clover from the pastures.

◆

Polwarth Ewes and Lambs on Oats at Carinya Stud, Bindango.

A Ready Reckoner For Tax Concessions

By E. O. BURNS, Agricultural Economist

Most farmers are aware of the special concession which permits them to treat certain capital expenditure as a deduction from taxable income. Clearing, weed control, dam construction, and so on come into this category.

This concession should always be borne in mind when considering whether a development project is worthwhile or not, as it has the same effect as a direct reduction in the cost of that project.

Table 1 has been drawn up to provide farmers with a quick and easy guide as to the saving they can expect to offset against the cost of the work. Because of our progressive system of taxation, this varies in accordance with the taxable income level.

The table is based on rates applicable to the 1959–60 financial year, and applies to incomes which are not subject to averaging.

To use the table, first find, in the left-hand column, the approximate taxable income you would expect to obtain if you did **not** incur the particular development expenditure you are considering. Then find the approximate cost of the project at the top of the other columns. Where

TABLE 1

Saving in Taxation Payable for Year in Which Special Capital Expenditure is Incurred

(*Nearest £*)

Estimated Taxable Income before Expenditure	Capital Expenditure Allowable as Deduction								
	£100	£200	£300	£500	£1,000	£1,500	£2,000	£3,000	£4,000
£	£	£	£	£	£	£	£	£	£
200	2	2	2	2	2	2	2	2	2
300	5	8	8	8	8	8	8	8	8
500	10	18	24	26	26	26	26	26	26
700	13	26	35	48	51	51	51	51	51
900	17	31	45	67	83	83	83	83	83
1,200	21	41	59	91	140	143	143	143	143
1,600	26	51	75	119	202	240	240	240	240
2,000	30	61	89	143	257	332	357	357	357
2,400	33	67	101	165	303	409	477	492	492
2,800	36	73	109	180	341	472	572	637	637
3,200	39	78	118	193	370	526	653	792	794
4,000	44	87	132	218	420	608	779	1,036	1,136
5,000	49	98	147	245	480	697	900	1,259	1,515
6,000	52	105	157	261	528	768	1,002	1,422	1,781
8,000	55	110	165	276	551	826	1,100	1,623	2,102

TABLE 2

REDUCTION IN TAXATION PAYABLE AFTER PURCHASE OF ASSETS SUBJECT TO SPECIAL DEPRECIATION

(*Nearest* £)

Estimated Taxable Income before Purchase	Value of Assets Subject to Special Depreciation									
	£100	£200	£300	£500	£1,000	£1,500	£2,000	£3,000	£4,000	£5,000
£	£	£	£	£	£	£	£	£	£	£
200	1	1	1	2	2	2	2	2	2	2
300	1	2	4	5	8	8	8	8	8	8
500	2	4	4	10	18	24	26	26	26	26
700	3	6	8	13	26	35	44	51	51	51
900	3	7	10	17	31	45	57	75	83	83
1,200	4	9	12	21	41	59	76	105	126	140
1,600	5	10	15	26	51	75	98	140	174	202
2,000	6	12	18	30	61	89	117	168	216	257
2,400	7	13	20	33	67	101	135	196	252	303
2,800	8	14	22	36	73	109	145	213	280	341
3,200	8	15	24	39	78	118	157	230	302	370
4,000	9	17	27	44	87	132	176	258	342	424
5,000	10	20	29	49	98	147	197	295	387	480
6,000	10	21	31	52	105	157	209	314	418	533
8,000	11	22	33	55	110	165	220	330	440	546

the columns meet is the amount you can offset against the expenditure by savings in taxation.

For example, if you expect your taxable income to be £700, and you are considering the expenditure of £500, you could expect to save £48 in taxation, which would reduce the real cost to £452.

Where averaging provisions apply, the table will still be fairly accurate where the expected taxable income is not very much different from the average income. Where there is a substantial difference, find in the left-hand column the two amounts representing taxable and average incomes, and the saving will be somewhere between these two levels.

For example, with an average income of £1,200 and a taxable income for the year of £2,000, an expenditure of £500 will reduce taxation by something between £91 and £143.

Special Depreciation Allowance

Primary producers are required to claim as a depreciation deduction one-fifth of the cost of practically all newly-acquired assets.

This is not as clear-cut a concession as is the deduction for capital expenditure. Depreciation of assets is a normal business expense, and the 20 per cent. rate does not result in any greater deductions in total than a rate based on the normal working life of the asset.

The special rate is designed to speed-up farm investment by increasing farmers' liquidity.

Table 2 is designed to assist in investment decisions by showing the reduction in taxation payable on the purchase of an asset subject to the 20 per cent. depreciation rate. Remember that this deduction only applies for five years, and thereafter no further deduction may be claimed for this asset.

The table is read in the same manner as Table 1. For example, if taxable income is estimated at £1,600 before making the investment, the purchase of an asset worth £2,000 will reduce taxation by £98 for the first year. The reduction for the next four years will depend on the taxable income for those years. In the absence of averaging provisions, if the taxable income the next year is £700, taxation will be reduced that year by £44.

Land May Be Levelled for Flood Irrigation Simply and Effectively by Using the Johns Leveller.

A Home-Made Pipe Bender Entered by Mr. R. H. HINZ (Brookstead) at the 1959 Toowoomba Farmers' Festival.

Brucellosis-Tested Swine Herds

(As at 1st April, 1960)

Berkshire

Clarke, E. J., Mt. Alford, via Boonah
Cochrane, S., "Stanroy", Felton
Cook, F. R. J., Middle Creek, Pomona
Crawley, R. A., Rockthorpe, Linthorpe
Edwards, C. E., "Spring Valley" Stud, Kingaroy
Farm Home For Boys, Westbrook
Fletcher, A. C., "Myola" Stud, Jimbour
French, A., "Wilson Park", Pittsworth
H. M. State Farm, Numinbah
H. M. State Farm, "Palen" Stud, Palen Creek
Handley, J. L., "Meadow Vale", Lockyer
Handley, G. R. "Lochlyn" Stud, Lockyer
James, I. M. (Mrs.), "Kenmore" Stud, Cambooya
Kimber, E. R., Block 11, Mundubbera
Law, D. T., "Rossvill" Stud, Aspley
Lees, J. C., "Bridge View" Stud, Yandina
Ludwig & Sons, A. R., "Beau View" Stud, Beaudesert
O'Brien & Hichey, J., "Kildurham" Stud, Jandowae East
Orange, L. P., "Hillview", Flagstone Creek
Pfrunder, P. L., Pozieres
Potter, A. J., Ascot, via Greenmount
"Tayfield" Stud, Taylor
Q.A.H.S. & College, Lawes
Regional Experimental Station, Hermitage
Rosenberger, N., "Nevrose", Wyreema
Schellback, B. A., "Redvilla" Stud, Kingaroy
Smyth, E. F., "Grandmere" Stud, Manyung, Murgon
Stark, H. L., "Florida" Stud, Kalbar
Thomas & Sons, F., "Rosevale" Stud, Laravale
Traves, G., "Wynwood" Stud, Oakey
Weier, V. F., "La Crescent", Clifton
Wolski, A., "Carramana", Warra
Young (Jnr.), W., Kybong, via Gympie

Large White

Assenbruck, C., Mundubbera
Barron Bros., "Chiltern Hill", Cooyar
Bell & Son, E. J., "Dorne", Chinchilla
Butcher, Dr. B. J. & Parnwell, A. J., Plunkett, via Tamborine
Clark, L. D., Greens Creek, Gympie
Duncan, C. P., "Colley", Flagstone Creek
Fowler, S., "Kenstan", Pittsworth
Franke, H. J., "Delvue" Stud, Cawdor
Garawin Stud Farm Pty. Ltd., 657 Sandgate Rd., Clayfield
Gibbons, A. E. H., Mt. Glorious
Gibson, H., "Thistleton" Stud, Maleny
H. M. State Farm, Numinbah
Hall, M., "Milena" Stud, D'Aguilar
Heading, J. A., "Highfields", Murgon
Horton, C. J., "Mannuem Brae" Stud, Mannuem, Kingaroy
Hutton, G., "Grajea" Stud, Cabarlah
Jensen, S., Rosevale, via Rosewood
Jones, K. B., "Cefn" Stud, Clifton
Kahler, J. & S., "Karajoy", East Nanango
Kanowski, A., "Exton", Pechey
Kennard, R. B., "Collar" Stud, Warwick
Larsen, H. L., "Oakway" Stud, Kingaroy
Law, D. T., "Rossvill" Stud, Aspley
Lees, J. C., "Bridge View", Yandina
Lobegeiger, L. C., "Bremer Valley" Stud, Moorang, via Rosewood
Mack, A. J., Mundubbera
Neilsen, L. R., "Sunny Hill," Ascot, via Greenmount
Neilsen, A. R., Ascot, via Greenmount
Palmer, V. P. & Son, "Remlap", Greenmount
Pampling, G., Watch Box Rd., Goomeri
Postle, R., "Yaralla" Stud, Pittsworth
Powell, R. S., "Kybong", Gympie
Q.A.H.S. & College, Lawes
Radel, V. V., Coalstoun Lakes
Radel, R. M., Coalstoun Lakes
Regional Experimental Station, Biloela
Robinson, O. R. & O. J., "Linvale", Argoon, Biloela
Skyring, G. I., "Bellwood" Stud, via Goomeri
Stanton, H. R., "Tansey" Stud, via Goomeri
Stewart, L., Mulgowie, via Laidley
Stumer, K. F., French's Creek, Boonah
Wharton, C. A., "Central Burnett" Stud, Gayndah
Wieland, L. C. & E., Lower Cressbrook, Toogoolawah
Zahnow, W., Rosevale, via Rosewood

Tamworth

Armstrong, H. J., "Alhambra", Crownthorpe, Murgon
Booth, J. D., Swan Creek, Warwick
Campbell, P. V., "Lawnhill" Stud, Lamington
Coller, R. H., Tallegalla, via Rosewood
Fletcher, A. C., "Myola" Stud, Jimbour
Herbst, L., "Hillbanside", Bahr Scrub, Beenleigh
Kanowski, S. E., "Miecho", Pinelands
Potter, N. R., "Actonvale" Stud, Wellcamp
Regional Experimental Station, Kairi
Salvation Army Training Home For Boys, "Canaan" Stud, Riverview
Skerman, D. F. L., "Waverley", Kaimkillenbun
Stephen, T., "Withcott" Stud, Helidon
Thomas & Sons, F., "Rosevale" Stud, Laravale
Wieland, L. C. & E., Lower Cressbrook, Toogoolawah

Wessex Saddleback

Ashwell, J., "Green Hill", Felton South
Cooper, G. J., Neumgua
Douglas, W., "Greylight" Stud, Goombungee
Dunlop, J. B., "Kunawyn", Acacia Rd., Kuraby
Kruger & Sons, "Greyhurst" Stud, Goombungee
Law, D. T., "Rossvill" Stud, Aspley
Mack, A. J., Mundubbera
Scott, A., Wanstead Stud, Grantham
Smith, C. R., "Belton Park", Nara
"Wattledale" Stud, 432 Beenleigh Rd., Sunnybank

Large Black

Pointon, E., Goomburra

Landrace

Grayson, D. G., Killarney
Neilsen, A. R., Ascot, via Greenmount
Orange, L. P., "Hillview," Flagstone Creek

Build This Tank For Your Dairy

By P. McCALLUM, Senior Dairy Adviser,
and H. WOODINGS, Silo Construction Officer.

A plaster concrete tank for storing water at the dairy shed was recently constructed on the farm of Mr. J. C. Naylor, Ferny Grove. The tank is the first of its kind in Queensland, and was built as a demonstration under the Commonwealth Dairy Extension Grant.

Lack of sufficient water suitable for cleansing dairy equipment is a problem on many dairies. It is recommended that provision be made to store a minimum of 2,000 gallons at the shed, such an amount ensuring adequate water during short dry spells.

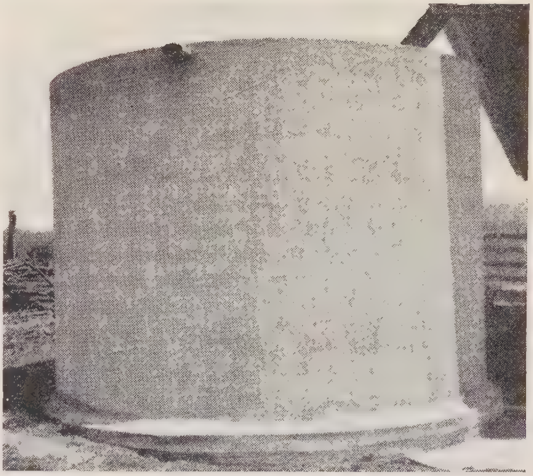
The purpose in erecting this plaster concrete tank was to demonstrate that a concrete tank can be built without the need for any boxing or heavy moulds, and with a minimum of materials. The principle of the method is first to build a "cage" or "basket" of welded steel reinforcing materials as used in the building industry. This "basket" is then placed in position on a concrete base and plastered with a sand and cement mixture. The farmer who has some experience with cement work should be able to do the plaster work satisfactorily. The result is an exceptionally strong tank which will not rust and which is economical of materials.

The dimensions of the tank are: height 6 ft.; diameter about 8 ft.; capacity 2,000 gallons approximately.

Materials

The materials required were as follows:—

1. *Major items*—
    - 16 bags of cement
    - 1½ yards of coarse sand
    - 1½ yards pit sand (or plaster sand)
    - 1 yard gravel, ⅜-in.
    - 35 ft. of 7 ft. 6 in. reinforcing fabric (6in. x 6 in. mesh)
    - 13 sheets of K-lath sheeting 98½ in. x 28 in.



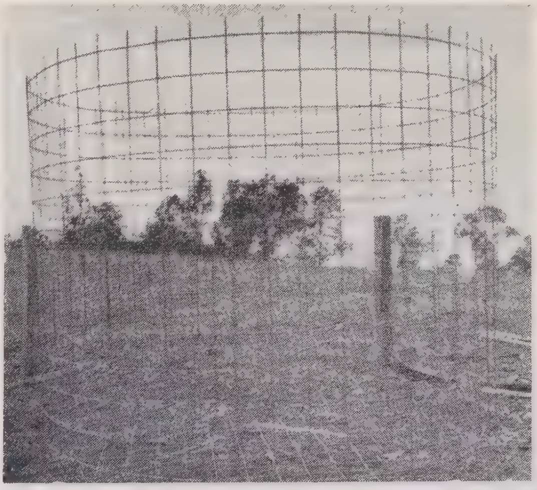


Plate 1 (Top): **Plaster Concrete Tank Built on the Dairy of Mr. J. C· Naylor, Ferny Grove.**

Plate 2 (Bottom): **The Wire Basket and Bottom Ring Ready to be Put in Position for Concreting to Start.**

2. *Sundry items*—
   - 4 to 5 ft. x 1 in. G.W. piping
   - 1 water tap
   - 1 gauze strainer
   - 16 x 5 ft. lengths x ⅜-in. steel rods for roof
   - 1 overflow pipe
   - ½ gal. mortar waterproofer.

The materials used cost about £34 (Brisbane). The cost of a 2,000 gallon galvanised tank made up is approximately £35 to £40 (Brisbane). The erection of a suitable stand would be an additional cost.

It is pointed out that costs of equipment should be related to their normal working life if any real comparison is to be obtained.

Galvanised iron tanks have a short life in some districts, and certain waters considerably shorten their normal useful life. In such cases a plaster concrete tank would be a suitable alternative.

Sequence of Work

First Day.—First of all the site for the tank should be levelled. The base should be level and firm. It is possible to construct this tank on sloping ground provided a satisfactory base is prepared.

The next step is the construction of the wire "cage" or "basket" (Plate 2). This is done adjacent to the levelled site. Later the "basket" can be easily carried into position by two men.

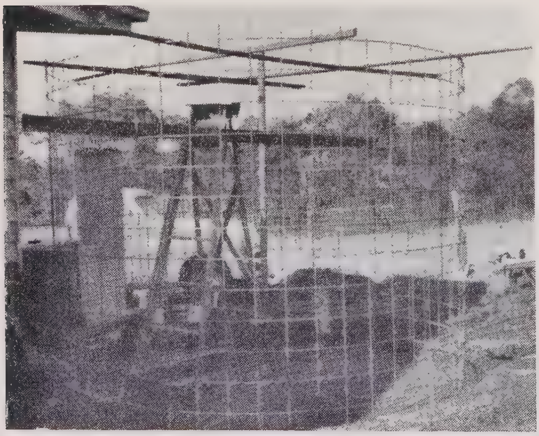


Plate 3

Basket Cemented into the Base and Ready to Take the K-Lath Sheeting.

A 26-ft. length of the 6 in. x 6 in. mesh reinforcing fabric is cut off the roll and made as near round as possible. This section is overlapped on the join by 6 in. (one mesh) and firmly wired at the seam from top to bottom. The bottom ring is cut out of this basket with a pair of steel cutters and the 6 in. vertical strips are then bent towards the centre. These turn-ins are then securely wired to the floor reinforcement.

A circle is marked on the levelled earth with a stick held at the end of a cord attached to a central stake. The radius of this circle should be about 4 ft. 6 in. This allows the base to extend some 6 in. beyond the wall of the tank. The circle is then boxed on the outside to a height of 6 in. Strips of hardboard, three-ply or light timber can be satisfactorily bent to shape.

Concreting of the base can now commence. Three inches of concrete are laid over the base. The mixture should be 4 parts gravel, 2 parts sand, 1 part cement. The steel basket is lifted bodily and immediately lowered on to the wet concrete base.

At this stage the water outlet pipe should be laid in position. This pipe should be set into the concrete bottom and not in the plaster wall, as any subsequent movement could crack the wall. This pipe should be bent at right angles beforehand and be of the desired length. To provide for complete drainage of the tank when necessary, a union connects the horizontal and vertical portions of the outlet.

A further 2 in. of concrete are now floated over the surface and finished with a mortar top of about 1 in. before the concrete has had time to set hard. This mortar top is made of 2½ parts of clean sharp sand and one part of cement (Plate 3).

Second Day.—Before plastering can commence, provision must be made to enter and leave the tank without disturbing the soft plaster. A stepladder or trestle is suitable.

A wire mesh plaster reinforcement with paper backing, known as K-lathing, is now firmly fixed with tie wire to the inside of the steel basket, working from bottom to top (Plate 4). As the width of the K-lathing is 28 in., three widths cover the inside nicely.

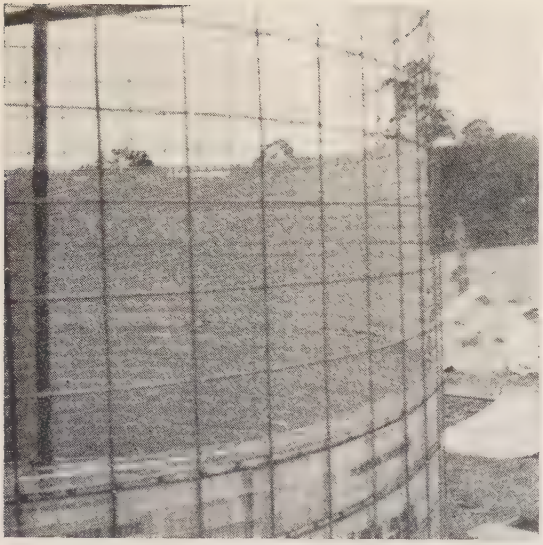


Plate 4
K-Lath Sheeting Being Wired to the 6 in. x 6 in. Wire Mesh.

This should be secured to the steel mesh about every foot so as to provide a firm backing when applying the plaster.

The overflow pipe is next fitted in position.

In Mr. Naylor's tank the roof reinforcing was not fixed in position until the walls were plastered, but it is recommended that the $\frac{3}{8}$-in. reinforcement rods for the roof be now fitted. These rods should be bent to the desired shape beforehand. Six inches on one end of the 5-ft. rod is bent at nearly a right angle, and 3 in. on the other end bent at the same angle. These short ends are later tied to a ring in the centre of the tank roof.

Each bent rod is now fitted, with the 6 in. bent section being fastened firmly with tie wire to the top of the wire basket. When all the rods are wired in position they are firmly tied in the centre to a ring. Alternatively they can be satisfactorily joined with wire.

Further reinforcement to the roof is not laid until the plastering of the wall is carried out.

In Mr. Naylor's tank the rods were hooked in the centre to a $1\frac{1}{4}$ in. pipe which was previously set upright into the base when it was poured (see Plate 3).

A batch of plaster mixture is now prepared from 2 parts of plaster sand, 1 part coarse sand, 1 part cement. This is mixed with water to plaster consistency. Experience on the first mix or two will show the desired consistency. It is a sound precaution to sieve all the sand used for the plaster work.

The first outer coating is now commenced. The interspaces in the 6 in. mesh are first filled. An ordinary plasterer's float is used. This coat should not be smooth, and it does not matter even if patches of daylight can be seen through it (Plate 5).

The first rough coat is immediately followed by a second coat, which should completely cover the steel mesh. Before this coat dries it is scratched and roughened to help the final coat to take the next day (Plate 6).

Before finishing this day's work it is recommended that the bottom of the wall both inside and out should be suitably smoothed with a sloping join (coved) to prevent water leakage at the wall and floor junction.

Third Day.—Enter the tank and tear off as much of the paper backing as possible from the K-lathing. Then plaster the inside. Two coats are advised. A mortar water-proofing compound should be incorporated in the second coat.

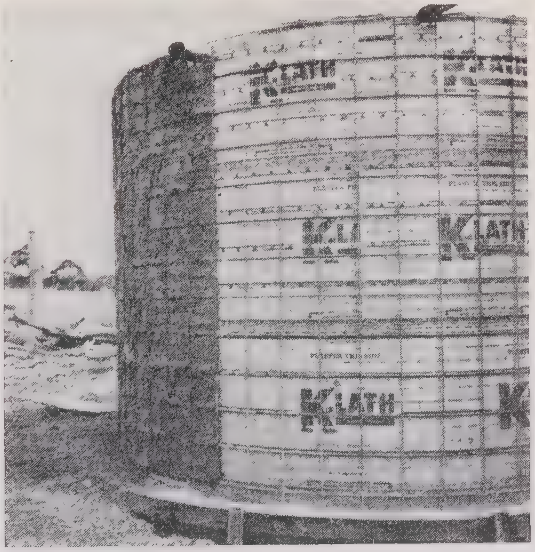


Plate 5
First Plaster Coat Applied to Part of the Reinforcing Material.

In Mr. Naylor's tank only one coat of plaster was applied to the inside. This was later painted with two coats of a water-proofing compound.

Neatly cove the wall to the bottom of the tank.

A final coat is now put on the outside wall. This should be as smooth as possible and make a wall about 1¾ in. thick.

Fourth Day.—The roof or top is now built. Some wire can be laced to the ⅜-in. rods at their widest spacings to give extra support to the K-lathing.

K-lathing is now placed over the roof reinforcement. The edges are trimmed to shape and firmly tied at the top of the reinforcement to the wall.

Plate 6

Roughened Second Plaster Coat Ready for the Final Coat.

Provision should be made to fit the gauze strainer into the tank top.

With the K-lathing firmly in position, a scratch coat of plaster is applied to the top. This is immediately followed by a final smooth coat. This gives a top of 1 in. to 1¼ in. thick.

If desired a protective coat of paint could be applied internally to the exposed reinforcing rods of the roof to minimise rusting.

All plaster must be moistened for a few days to cure, but no storage water allowed to enter until curing is complete.

Labour Costs

The time taken to build this plaster concrete tank was 4 days, and it was erected by working between milkings. The plasterer requires the assistance of one man throughout to prepare continuous supplies of plaster.

If a plasterer is employed he would be required for 2½ days. This would add considerably to the cost. However, as mentioned earlier, the plastering work in this tank requires no more skill than that possessed by the "handy" farmer.

Should any farmer contemplate building a plaster concrete tank similar to this unit, further information and guidance can be obtained from the Department of Agriculture and Stock, Brisbane.

❧

Common Weeds of Farm and Pasture

by S. L. Everist, B.Sc., Government Botanist.

A handbook that contains brief descriptions of about 110 of the common weeds of Queensland with notes on their distribution and control.

Price to Queensland farmers	5s.
To others	7s. 6d.

Available from Department of Agriculture and Stock, Brisbane.

Orchard and Garden

Land Preparation for Beans.—Vegetable crops will always do better on land that is nicely cultivated and in good tilth.

And the important French Bean crop is no exception. Many poor stands, indeed, can be attributed mainly to casual or last-minute soil preparation.

There is no substitute for thorough preplanting cultivation. At least two ploughings are needed. The first, about 9 in. deep, should be made to turn in the green manure crop, about six weeks before sowing. This interval is essential for proper decomposition of the organic matter.

The second ploughing, normally to 6 or 8 in., can be left until shortly before sowing. This reduces the soil from the rough to a more friable condition. Then a few good harrowings will produce the texture and tilth desirable for seed germination and plant growth.

The soil is then ready for drilling and planting of the seed.

Soils vary, of course, as does the amount of tillage required. Self-mulching types break down to a tilth easily, while others require more handling; clodding may be more persistent. Whatever the soil type, however, make sure that final preparation produces conditions favourable for quick germination. If the soil is rough, lumpy, and cloddy you can only expect poor germination, uneven, slow growth, and, worst of all, low yields.

Harvesting the Meyer Lemon.—The Meyer is not a true lemon but actually a lemon-orange hybrid with a mixture of parental characteristics. When the fruit matures on the tree the colour is light orange and the shape is roundish. Again, tree-coloured fruit does not keep nor carry well.

These are obvious disadvantages; features without appeal to lemon buyers.

However, if the Meyer is picked in the early, green-mature stage and then artificially coloured in a suitable chamber, the fruit has an acceptable lemon shape and the rind a good lemon tint. In this condition, the fruit attracts buyer interest, particularly during the January to early March period when supplies of Villa Franca and Lisbons are normally scarce.

Meticulous and careful harvesting is essential with the Meyer.

Each fruit should be double clipped. Do not pull the fruit. Stem-end injury will only open the way for disease infection. The rind, too, is soft and easily injured; handling should be gentle right from tree to packed case.

The Meyer must be really dry before colouring is attempted. Moist fruit is very prone to scald and breakdown.

—D. DOWDLES, Adviser in Horticulture.

Grafted Passion Vines.—Grafted passion vines have given a big boost to passionfruit plantings on farms and in home gardens. But although the golden passion rootstock is resistant to the serious disease Fusarium wilt, the plants are just as susceptible as ordinary purple passion vines to other pests and diseases.

Many people seem to expect their grafted vines to be resistant to all major pests and diseases. But this is not the case, and precautions must be taken to avoid losses. The Agriculture Department has recently received many inquiries from farmers and gardeners about damage by fruit fly, woodiness virus and brown spot.

The vines must be pruned each year, and in the warmer months, sprayed regularly with zineb or a copper fungicide to control brown spot. Fruit fly is controlled by spraying with 0·2 per cent. DDT, and pests like red scale and mites must also be combated when necessary.

Timing Banana Cropping.—In North Queensland, bananas will usually mature their first bunch in 12 to 15 months from planting. Timing of the first crop is, therefore, a fairly easy matter by adjusting the planting. For commercial production the winter market is most profitable to North Queensland growers so planting between April and August is indicated. The period in the middle of the winter should be avoided because establishment of the plants then is very slow and they may make only weak growth.

The big problem, however, is in timing the ratoon crop to obtain winter harvesting too. If suckers are allowed to grow naturally on plants set to obtain a winter crop they will produce the ratoon crop in the following summer. This is most undesirable for the farmer because harvesting conditions are unsatisfactory then, the fruit is soft and difficult to transport to the market in good condition, there is grave risk of loss from fruit fly, thrips and caterpillars, and, to cap it all, the prices obtained are likely to be poor.

Of course, these early suckers can be destroyed and later produced suckers can be left for the ratoon crop. But the difficulty in this is that the later suckers are frequently weak and lacking in vigour so that they cannot produce a good bunch. It is only the early suckers that can be depended upon to have the necessary vitality.

The solution to this apparent difficulty is to retain the early, vigorous sucker as a nurse plant and take out all the later suckers. By the time this nurse plant is about one third to one half grown it in turn will throw up a vigorous sucker some time between about April and August. The nurse sucker should then be cut off and its growing point destroyed so that its follower will become the plant to produce the ratoon crop at the time it is wanted in the following winter.

—*S. E. STEPHENS, Horticulturist.*

Electrical Conductors Save Life and Property

Just as the lightning conductor protects the building from nature's electrical outbreaks, so does the earthing conductor protect the home from any unnatural electrical breaks. Therefore, it is not surprising that when electrical accidents do occur, the most common cause is a lack of effective earthing of electrical installations.

For instance, should a fault develop in the wiring of an installation, and the earth connection happen to be broken, then the exposed metal parts of the installation become "alive." This happens because the earthing failure prevents the fuse or circuit breaker from operating and cutting off the defective part of the installation from the supply.

Such an occurrence can cause electrical shock in the most unusual circumstances. Cases have been recorded of shocks received from clothes lines which had been in contact with energised earth wires.

More commonly, people receive shocks when they come into contact with metal portions of the installation including the disconnected earth wire.

Periodic Checks

Of course such accidents should never happen. Earthing conductors on electrical installations are put there for protection purposes, not injury, and the electrical safety of a home depends on periodic checks of the wiring to ensure that the earthing conductors have not been interfered with or damaged in any way.

A faulty lightning conductor only constitutes a hazard during an electrical storm, but a faulty earthing conductor is an ever-present menace to the whole household. For this reason there should be no question of doubt concerning the safety of household wiring.

Any local electricity supply authority will arrange inspection of house wiring and household appliances upon receiving a written request. What is more they will conduct the inspection at their own expense, and continue the free inspections once every five years.

Thus, the initial cost of electrical safety is the price of a postage stamp.

—*State Electricity Commission.*

GRACEMERE

A Queensland Fauna Sanctuary

By **C. ROFF,** Fauna Officer

Gracemere is linked with the early history of Central Queensland, and is the oldest in the coastal chain of waterfowl sanctuaries.

On May 7, 1853, Charles and William Archer, when on a land selection expedition from Eidsvold on the Burnett River, arrived in the area now called Gracemere. The following extracts from letters written in 1853 by Charles Archer to their father William Archer in Laurvig, Norway, describe the locality:

> "Three miles further in a northerly direction we struck the Lake, which to our surprise was—for this country—a most magnificent sheet of fresh water about 2 miles long and ¾ mile wide—as near as we could guess. Near its western end we found a well watered creek, with scrub a few hundred yards to the edge of * Farris, as we named the Lake. The edges round Farris are of whinstone. Rich flats also run down to the lake exceedingly well adapted for cattle."
>
> "It is almost covered with water fowl such as pelicans, swans, geese, ducks in endless variety, coots, etc., etc."

In 1855, the land was taken up for grazing by the Archer Brothers. They were impressed by the lagoon and birdlife which reminded them of their native Norway and immediately established a private sanctuary. During 1885 the

Plate 1

Gracemere, A Queensland Fauna Sanctuary

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* The name of the Lake was changed from Farris to Gracemere about 1855 in honour of the wife of another brother, Tom Archer, who had arrived at Eidsvold by bullock wagon in 1853.

locality was declared an official sanctuary for birds, and in 1916 this was extended to include mammals.

The waters in this 1,400-acre sanctuary come from Gracemere Creek which spreads into the extensive natural Gracemere Lagoon and adjacent swamps now fringed by grasslands and some cultivation. Since 1853 Gracemere has dried out on only three occasions: 1902, 1942 and 1945.

The sanctuary is situated south west of Rockhampton about six road miles along the Gogango Highway. The access road turns off half a mile before Gracemere Railway Station and runs a mile westwards to the picturesque old homestead standing on a small peninsula jutting into the lagoon. This shingle-roofed hardwood-slabbed homestead was built in 1858 and is still occupied.

In 1880 Carl Lumholtz, a member of the Royal Society of Sciences of Norway, mentioned 37 species of birds on Gracemere and during a survey in 1959, John Warham, an ornithologist, recorded 89 species. Today flights of grey teal, black swans, black duck, white-eyed duck, blue-winged shoveller and maned geese, are the principal fauna. Coots, musk duck, and the occasional graceful lotus bird occur and the migrant pelican is often on the waters of the lagoon. Possums, wallabies and native water rats are also present.

Harmless green tree snakes and large goannas are common together with occasional brown and black snakes. In the waters, sleepy cod, mullet, garfish, bony bream and freshwater jew abound.

The ridges are sparsely covered by silver-leaf ironbarks, long-fruited bloodwoods, poplar gums and coolibahs; a few trees such as yellowwood, Leichhardt and fig remain as evidence of the original riverine vine-scrub.

Along one edge of the lagoon is a small area of papyrus introduced from the Nile River (Sudan) in 1870.

Nearer the edges are paper-bark tea-trees, sedges and couches, with the cleared flats and slopes covered by grasses such as red Natal grass, Rhodes grass, and the cultivated para grass and green panic.

Gracemere is one of the few refuges in Queensland in which wildlife has been protected constantly since the early days. Accordingly the area is well known and respected by the game-shooting community of Central Queensland. It is a splendid example of natural habitat in proximity to an urban population.

SCIENTIFIC NAMES OF FAUNA AND FLORA

Fauna

Black duck ..	*Anas superciliosa* Gmelin
Black snake ..	*Pseudechis porphyriacus* Shaw
Black swan ..	*Cygnus atratus* Latham
Bluewinged shoveller .	*Anas rhynchotis* Latham
Bony bream ..	*Nematalosa eribi* Gunther.
Brown snake ..	*Demansia textilis* Dumeril and Bibron
Freshwater jew	*Neosilurus* sp.
Garfish ..	*Arrhamphus sclerolepis* Gunther
Goanna ..	*Varanus varius* Shaw
Green tree snake	*Ahaetulla punctulatus* Gray
Grey teal ..	*Anas gibberifrons* Muller
Lotus bird ..	*Irediparra gallinacea* Temminck
Maned goose ..	*Chenonetta jubata* (Latham)
Mullet ..	*Tachystoma* sp.
Musk duck ..	*Biziura lobata* Shaw
Pelican ..	*Pelecanus conspicillatus* Temminck
Possum ..	*Trichosurus vulpecula* Kerr
Sleepy cod ..	*Oxyeleotis lineolatus* Steindachner
Wallaby ..	*Wallabia bicolor* Demarest
Water rat ..	*Hydromys chrysogaster* Geoffroy
White-eyed duck	*Aythya australis* (Eyton)

Flora

Coolibah ..	*Eucalyptus microtheca* F. Muell.
Couches ..	*Cynodon dactylon* (L.) Pers., *Paspalum distichum*. L., *Pseudoraphis spinescens* (R.Br.) J. Vickery
Fig	*Ficus* sp.
Green panic ..	*Panicum maximum* Jacq. var. *trichoglume* Eyles
Leichhardt tree	*Nauclea orientalis* L.
Long - fruited bloodwood ..	*Eucalyptus polycarpa* F. Muell.
Paper - barked tea-tree ..	*Melaleuca leucadendra* (L.) L.
Papyrus ..	*Cyperus papyrus* L.
Para grass ..	*Brachiaria mutica* (Forsk.) Stapf.
Poplar gum ..	*Eucalyptus alba* Bl.
Red Natal grass	*Rhynchelytrum repens* (Willd.) C. E. Hubbard
Rhodes grass ..	*Chloris gayana* Kunth.
Sedges	*Eleocharis* spp. *Cyperus* spp. *Fimbristylis* spp.
Silver-leaf iron-bark ..	*Eucalyptus melanophloia* F. Muell.
Yellowwood ..	*Terminalia oblongata* F. Muell.

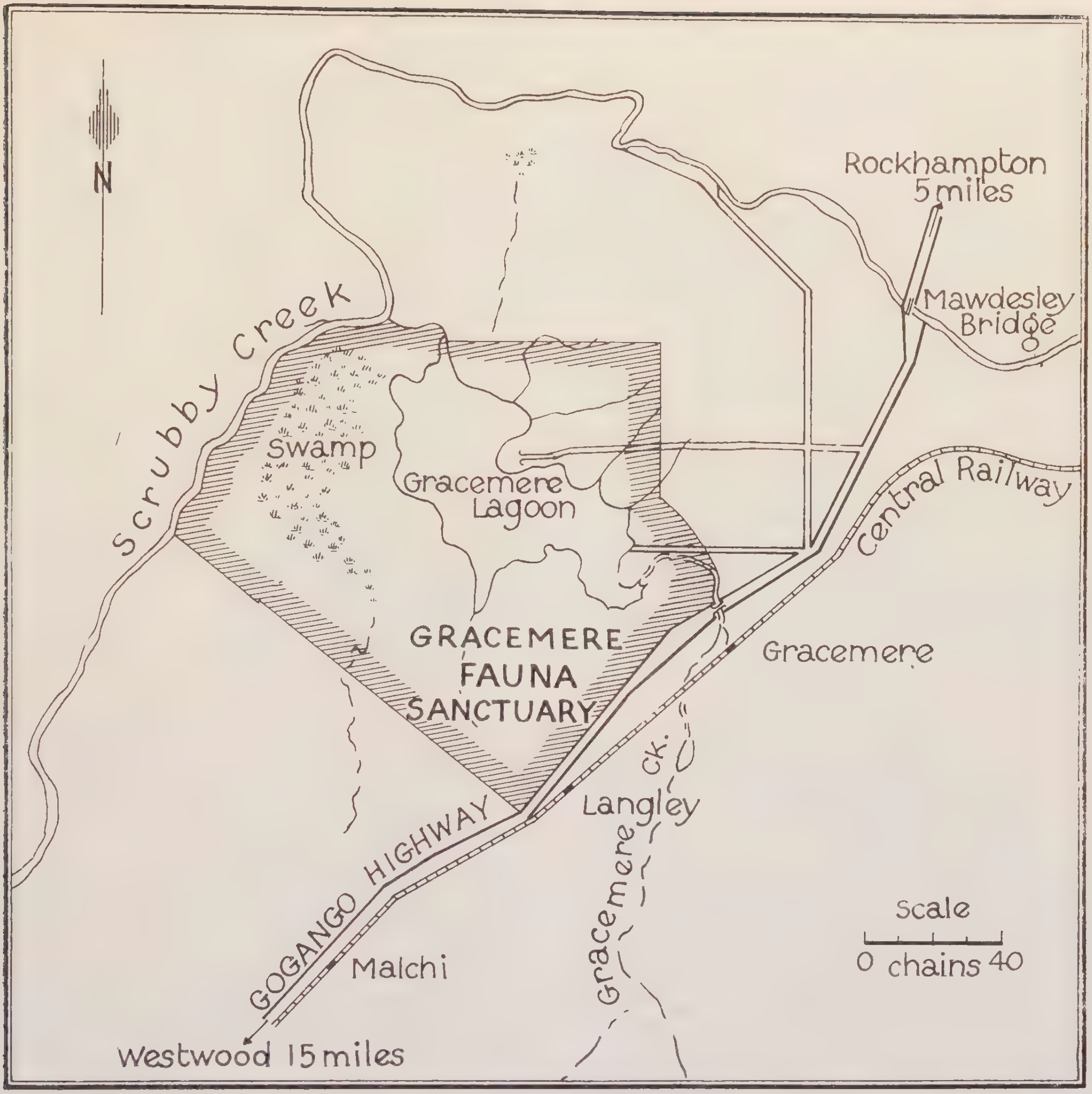

N
Rockhampton 5 miles
Mawdesley Bridge
Scrubby Creek
Swamp
Gracemere Lagoon
Central Railway
GRACEMERE FAUNA SANCTUARY
Gracemere
Langley
Gracemere Ck.
GOGANGO HIGHWAY
Malchi
Westwood 15 miles
Scale
0 chains 40

Plate 2

Map Showing the Gracemere Fauna Sanctuary

◆

QUEENSLAND BUSH BOOK CLUB

The Queensland Bush Book Club will supply reading material to anyone living beyond the reach of a town library. For a fee of 3s. 6d. a year, subscribers may receive parcels of 10 books, and some magazines and illustrated papers. Parcels will be consigned to the subscriber free of cost to the nearest railway station but subscribers will make their own arrangements for delivery from the station. Each parcel contains about three months' reading but exchanges may be made more often if required.

Write to Secretary, Bush Book Club, Victory Chambers, Adelaide Street, Brisbane, enclosing 3s. 6d. and you will be enrolled as a member. If living north of St. Lawrence write to Bush Book Club, Box 475 G.P.O., Townsville, and if in the Brisbane Valley to Bush Book Club, Ipswich.

New Look For Wool

From Eleanor Knox,
Australian Wool Bureau.

Filmy wool fabrics, ethereal and cool, have given a new look to summer wardrobes. The introduction of fineweight plain and printed wool fabrics means round-the-clock and round-the-year wool wardrobes are possible for everyone.

Summerweight wools, which made their Australian fashion debut at the Royal Brisbane Show, had been viewed by 1,500,000 people when the parades finally finished at the Royal Perth Show, and this innovation in wool fashion presentation met with universal approval.

Today it is possible to swim, dance, marry, dine, play or work in lightweight wool which offer the dressmaker (home or professional), every facility for design, and easy workmanship.

Beach Wear Too

The new summerweight wools have been used with remarkable success for beach wear, and one of the outstanding entries in the Australian Wool Awards was a fine white wool fabric printed in cornflower blue carnations. This same material patterned in sunshine yellow on white fashioned an attractive race frock, worn with a matching yellow coat.

Vividly patterned wool fabric re-embroidered in matching sequins was used in a dramatic evening gown, which was submitted for judging, and a wonderfully draped and embroidered wedding gown, with matching wool gloves, headdress, and shoes, equally emphasised wool's place in the fashion world.

But wool's new look is not confined to the fashion field. The band of magicians, the scientists who work with wool, have developed in recent months a new technique for moth-proofing, shrink-proofing, permanent creasing and pleating, and more recently, wash and wear.

Stain Repellent

But the magic does not stop there. From fluorine has come a remarkable compound that forms a protective film around each fibre of the cloth which makes it stain repellent.

This is known as "Scotchguard" and in the United States today manufacturers are using the process for upholstery.

Many slacks are now available in Australia which have also received this magic coating, and other garments treated with the new resin are also available in Brisbane.

Demonstrations have shown beyond all doubt that this new compound has given yet another new look to wool fabric.

Tomato sauce, grease, dirt, ink, lamp black and various other stain producing elements were spilt on to the treated fabric and then blotted with tissue which left the material immaculate.

This process has also been applied to a range of wool fabric covered women's shoes with satisfying results.

Wool's ability to breathe, coupled with its safety factor, makes it ideal for children's wear. It is equally valuable as an aid to easy travelling, and the variety of wool fabrics offering will be substantially increased next year when the mills extend their already wide range.

The home knitter will find new and exciting colours in the popular chunky-knit weight for winter wear, or in cobweb-fine wools for evening sweaters.

"Um . . m; it's good!"

Honey Deserves a Place in the Diet

Honey, a food that generates energy quickly, deserves a place in your family's diet all the year round. Especially is this so when, these days, the industry markets varieties of honey to please all tastes.

Flavour and colour of honey vary with the flowers from which the bees gather the nectar. Ironbark and box honeys have wide appeal as these are light-coloured and have mild sweet flavours. Golden honeys from blue and river red gums also have excellent taste. Ground flora yield deeper, full-flavoured honeys.

While the greatest amount of honey is sold in a liquid form, some honeys are also marketed candied or creamed; these are becoming more and more popular because their firmer texture allows easy spreading.

As a variation, honey is marketed in attractive 1 lb. honeycomb sections taken direct from the hive. Honeycomb is also packed in jars surrounded by clear fragrant honey. In these packs, the honey retains all its natural floral bouquet.

Honey is about four-fifths simple sugars which are easy to digest because they are already in a form that can be absorbed by the human body; the remaining weight is water with small amounts of proteins, minerals and vitamins. Among honeys there is little difference in energy value but the full flavoured honeys contain most minerals and vitamins.

Variety of Uses

As an adventure in good eating, honey has a wide variety of uses. It provides a new taste thrill in breakfast cereals, pancakes, toast and waffles; in cooking it can be used in sauces, cakes, biscuits, custards, puddings, confectionery and beverages.

Honey today has all the qualities that have made it a favourite sweet throughout the ages and those who eat honey are enjoying one of Nature's treats. There is no mystery associated with honey; it is a simple, pre-digested food prepared by the bees from the nectar of flowers for their own use and which is harvested from them by man for his use.

In addition, beekeepers and packers have modern ways of handling and packaging honey that make it appealing to the taste and convenient to use.

As a Spread

Use *honey* on buttered bread, toast, pancakes, waffles or other hot breads.

For sandwich fillings, after spreading bread with butter, prepare and use small servings of any of the following:—

- Peanut paste and *honey*.
- Dates, figs and raisins mixed with *honey* and a little lemon juice.
- *Honey* topped with finely chopped apple or sliced or mashed bananas.
- *Honey* sprinkled with grated raw carrot or grated orange peel and dusted with nutmeg.
- *Honey* spread with chopped nuts.
- *Honey* and thinly sliced cheese.
- *Honey* mixed with whipped cream.

In sandwich fillings the most suitable honeys are the candied or creamed.

At the Breakfast Table

Honey with Grapefruit. Halve grapefruit. Free from rind with grapefruit knife and separate sections. Drizzle *honey* over cut sections. Place in refrigerator overnight.

Honey with Cereals. Honey enhances the flavour of breakfast cereals and porridge. Some prefer to sweeten by drizzling *honey* over the dry cereals before adding milk.

Try it this way! Warm the milk and, before using, stir in sufficient *honey* to give the desired degree of sweetness. *Honey* blended with warm milk is delicious.

For the Cake and Biscuit Tin

Walnut Cake

2 tablespoons *honey*
1 cup brown sugar
4 oz. butter
2 eggs
1½ cups S.R. flour
½ cup milk
½ teaspoon vanilla
½ teaspoon cinnamon
½ cup chopped walnuts

Cream butter and sugar, add egg yolks and beat in well. Sift flour and cinnamon. Mix *honey*, milk and vanilla. Add dry ingredients alternately with the liquids, mixing lightly. Add nuts. Beat egg whites till stiff, and fold lightly into mixture. Bake in 7-in. round tin in moderate oven about 40 min. When cold, ice with lemon icing and sprinkle with chopped walnuts.

Light Honey Sponge (No milk or butter)

½ small cup *honey* (melted)
4 eggs
½ cup sugar
½ cup arrowroot
2 teaspoons plain flour
½ teaspoon cream of tartar
½ teaspoon bicarb. soda

Separate whites of the eggs (into mixing bowl) from yolks (into a cup), beat whites till stiff, add sugar gradually. Add beaten yolks and beat till stiff and spongy. Sift arrowroot, flour and bicarb. soda 3 times, add to egg mixture. Lastly, add hot melted honey, stir thoroughly with knife. Cook in well-buttered 9-in sandwich tins in slow oven until the cake sets and begins to leave side of tin. Join with creamy filling. Dust top of cake with icing sugar. This is a luscious cake, but watch carefully as it burns easily.

Honey Cinnamon Rolls

1 tablespoon *honey*
½ lb. S.R. flour
¼ teaspoon salt
1 dessertspoon castor sugar
2 oz. butter
1 egg
⅔ cup milk

Sift S.R. flour and salt; rub in butter, add sugar; combine honey, beaten egg and enough milk (slightly warmed) to make ¾ cup liquid. Mix into fairly firm dough and knead slightly; press or roll out to ½ in. thickness, cut with round cutter and fold half over; glaze with remainder milk. Sprinkle with sugar and cinnamon. Bake in hot oven for 10 to 12 minutes.

Honey Crisps

2 oz. *honey*
3 oz. butter
1 oz. brown sugar
4 oz. cornflakes

Melt butter and honey together in large saucepan, but do not let mixture get very hot. Stir in the sugar, then the cornflakes at once. Stir till they have blended with the other ingredients, then turn the mixture into a well-greased *oblong* tin. Flatten down evenly with back of large spoon, and bake in moderate oven till pale golden brown. Run a sharp knife around the edges of the tin, and leave till cold. Then cut into shapes and turn out.

For Dessert

Honeyed Fruit Jellies

3 tablespoons *honey*
¼ cup lemon juice
⅔ cup orange juice
⅔ cup hot water
1½ dessertspoons gelatine
Sliced fruit such as bananas, oranges and whole strawberries

Dissolve gelatine in hot water. Add fruit juices and honey, pour into a mould. Sliced fruit may be set in jelly, or served with jelly. Serve with cream or custard.

Steamed Honey Pudding

2 level tablespoons *honey*
1½ rounded tablespoons butter
2 teaspoons sugar
2 eggs
Bare ¼ cup milk
Few drops essence lemon
4½ tablespoons S.R. flour (heaped)

Beat butter and honey to a cream, add eggs, beat well. Add milk and lemon essence, then flour (sifted). Steam for 1½ hours. Serve with cream or custard. Sultanas, nuts or dates may be added or chocolate and vanilla essence.

Honey Baked Custard

1½ tablespoons *honey*
1½ cups milk
Salt
2 eggs
A little vanilla

Beat eggs with honey, add other ingredients. Pour into buttered pie-dish, sprinkle with nutmeg if desired. Cook gently till set.

Honey Pears and Lemon Sauce

¼ cup *honey*
1 tin pears
1 tablespoon butter
1 cup crumbed sponge cake
¾ cup cold water
¼ cup lemon juice
1 cup sugar
1 egg

Lemon Sauce:
1 oz. butter
2 level tablespoons cornflour
Grated rind of 1 lemon

Drain pears and dry well. Cream butter, add honey, mixing well. Dip pears in honey and butter mixture. Roll in cake crumbs. Place in well-greased shallow dish. Bake in rather hot oven, with decreasing heat, about 20 min. Serve with lemon sauce.

Lemon Sauce.—Mix cornflour with cold water in saucepan. Heat, stirring until thick. Add lemon rind and juice, sugar and lightly-beaten egg. Cook about 3 min., stirring all the time. Do not boil. Add butter, mix in well.

Honey Lemon Butter Tart

Pastry:
1 cup S.R. flour
1 heaped tablespoon butter
2 tablespoons sugar
1 beaten egg
Pinch of salt

Lemon Butter:
⅓ cup *honey*
¼ cup lemon juice
½ cup sugar
3 beaten eggs
2 tablespoons butter

Pastry.—Sieve flour and salt. Rub in butter, add sugar and mix well. Stir in beaten egg to make a soft dough. Roll out and line a pie plate. Decorate outer edge and prick bottom with fork. Bake in hot oven till golden brown.

Lemon Butter.—Blend all ingredients in a saucepan. Cook in double boiler till thick. Pour into tart shell, top with whipped cream when cool.

For the Children

Honey Toffee Apples

½ lb. *honey*
¼ lb. butter
½ lb. brown sugar
Cochineal
Apples

Melt butter in saucepan, add honey and sugar. Stir slowly with wooden spoon till boiling. Add enough cochineal to give a bright red tint. Boil about 10 min. Test a little mixture in cold water. It should be crisp. Mount apples on sticks, dip each in, and turn it round till well coated. Stand in a rack to dry.

Honey Gems

1 tablespoon *honey*
½ cup brown sugar
1 egg
1 cup S. R. flour
1 teaspoon cinnamon
2 tablespoons butter
A little vanilla
¼ cup milk
Pinch salt

Cream butter and sugar, add vanilla and egg, beat well. Then add milk and honey. To this mixture add the flour, salt and cinnamon sifted together. Place the mixture in teaspoonfuls in warm greased gem irons, and bake in moderate oven about 15 min. Ice with lemon icing. Makes two gem irons full.

Honey Crackles

1 tablespoon *honey*
3 oz. butter
4 cups cornflakes (or any whole puffed grain)
2 tablespoons sugar

Bring honey, sugar and butter to the boil and boil 3 min. in a large enough saucepan to take the cornflakes. Then put cornflakes with a

Honey on Fresh Bread and Butter Replenishes Energy After School; and it Tastes Delicious.

pinch of salt into the toffee and mix quickly. Have paper cups ready and put in mixture. Let dry for a few minutes in the oven.

Honey Chocolate Fudge

⅔ cup *honey*
¾ cup cream
Nutmeats (walnuts best)
2 cups sugar
¼ lb. grated milk chocolate

Combine sugar and grated chocolate, add honey and cream. Mix well. Cook slowly until a little of the mixture will form a soft ball when tested in cold water. Remove from stove Beat until creamy and it begins to lose its shiny appearance. Pour on buttered plates and cut in squares before it becomes too cold. Store in a cool place. (May be rolled in finely-chopped walnuts, or nuts may be omitted altogether.)

Honey Caramel Toffee

¼ cup *honey*
½ cup vinegar
¾ cup sugar

Place ingredients in saucepan and boil briskly until small quantity dropped into cold water becomes crisp. Turn into greased dish to cool.

For Afternoon Tea

Honey Mince Pies

1 tablespoon *honey*
Pinch salt
¼ lb. butter
Mincemeat
2 cups S.R. flour
1 heaped tablespoon sugar
1 egg

Rub butter into flour sifted with salt, add sugar and lastly beaten egg mixed with the honey. Make into stiff dough and roll out.

Cover greased patty tins with pastry, fill with mincemeat, cover with pastry and nip the edges close together. Put pies in brisk oven and bake for 25 min. or less if required.

Honey Scones

1 teaspoon *honey*
1 tablespoon butter
Enough milk to mix
3 cups S.R. flour
Pinch salt
1 teaspoon grated orange rind

Rub butter into flour, then honey and milk. Mix roll, and cut into scones. Cook on a hot slide in hot oven for 10 min. An egg may be included if desired. (Do not mix too dry.)

Monte Carlo Biscuits

1 dessertspoon *honey*
½ cup sugar
2 cups plain flour
½ cup butter
1 egg
1 teaspoon bicarbonate soda

Cream butter and sugar, add egg, beat again, then add honey. Lastly add flour and soda sifted together. Break off small pieces and roll into balls, place on greased tray and press flat with fork. Bake in moderate oven. When cold, join by spreading jam on one side of biscuit and icing on another. Store in airtight tin, and better if kept for a while before eating.

To Quench the Thirst

Honey Fruit Punch

4 tablespoons *honey*
1 cup orange juice
½ cup grapefruit juice
½ cup lemon juice
2 cups water
1 tablespoon sugar

Blend ingredients well and chill. Serve in tall glasses with ½ orange slice to garnish.

Honey Egg Flip

1 teaspoon *honey*
1 egg
Milk
Flavouring

Beat egg, add honey, fill glass with milk, and add vanilla. (Better warm than cold.)

Honey Gingerade

½ cup *honey*
4 teaspoons lemon juice
1 cup water
½ teaspoon ground ginger
1 tablespoon sugar

Put the water, ginger, honey and sugar into a saucepan, boil till it syrups, stir in the lemon juice and leave till cold. Strain. Serve with iced water.

At Any Time

Honey Salad Dressing

1 teaspoon paprika
½ teaspoon powdered dry mustard
½ teaspoon salt
½ teaspoon celery salt
½ cup liquid *honey*
3 tablespoons lemon juice
¼ cup vinegar
1 cup salad oil

Mix the dry ingredients. Add the honey, lemon juice, and vinegar. Slowly add the salad oil, beating until well blended. Makes about 2 cups.

Potato Cakes

1 small dessertspoon liquid *honey*
½ lb. plain flour
1 small teaspoon yeast
Raisins
2 lb. potatoes
1 small tablespoon butter or lard
Pinch salt

Cook potatoes in their jackets, peel, mash, and mix with flour, butter, yeast, honey, salt and a few raisins. Put into a basin and leave to rise for good hour. Then divide into small oval buns and bake in a fairly hot oven. Would be good with curry dishes (makes 24). A useful supper dish with cheese and chutney.

Honey Baked Ham

Brushed or drizzled in ham during the last half hour of baking, honey adds flavour and gives a golden glaze.

Savoury Stuffed Veal

Four potatoes
1 cup grated cheese
1 cup breadcrumbs
2 tablespoons lemon juice
Pepper
1 large onion
½ cup *honey*
1½ to 2 cups stock
2 tablespoons flour
1½ lb. veal steak (cut in one piece)
2 bananas
Salt
1 tablespoon bacon fat
1 tablespoon chopped parsley
Nut of butter

Line greased casserole with parboiled potatoes cut into slices ⅛ in. thick. Mix flour and cheese, rub well into steak. Cut a pocket in steak and fill with breadcrumbs mixed with roughly chopped bananas, lemon juice, salt and pepper. Sew up with coarse thread. Brown well on all sides in hot bacon fat, place in casserole. Brown the onion and place on top of meat, add balance of flour and cheese mixed with parsley. Warm honey and butter, pour over the steak, then add stock. Cover and bake in moderate oven 1½ hours, removing cover for last 15 min. Serve piping hot garnished with parsley.

Save Your Child From Lead Poisoning

In Queensland, there is a total prohibition in paint of white lead, outstandingly the main cause of lead poisoning.

Because certain colours used for trimmings (mainly yellows and greens) are usually obtained from lead chromates, the use of these will be allowed, subject to certain conditions. They must not contain more than 5 per cent. soluble lead, and they must not be used anywhere easily accessible to children.

While the most recent legislation will eventually remove all danger of lead poisoning from paints in Queensland, certain lead hazards will still exist for some time. In some places there is still old, powdered lead paint within reach of children.

Lead Danger Spots

Examples of typical danger spots are:—

(*a*) Verandah rails.
(*b*) Inside walls of verandahs.
(*c*) Gates and fences.
(*d*) Brightly-painted furniture and interiors (especially greens, yellow and orange).

By touching such places in their play, children get powdered paint on their hands. This can be transferred easily to the mouth especially by nail-biters and thumb-suckers.

Examples of contact with lead paint are:—

(1) Children climbing on and peering through gates.
(2) Small children holding on to verandah rails, and sometimes licking raindrops from them.
(3) Older children drawing on painted walls and then licking their fingers to rub drawings off.

Effects of Lead Poisoning

A very small amount of lead taken into the system daily can be dangerous. There may be no immediate effects, but amongst these children affected by lead, about one-third develop chronic nephritis (Bright's Disease) later in life. Fatalities from this usually occur between the ages of 20-40.

Amongst those children who are affected early by lead poisoning, these are the progressive stages:—

Stage 1.—The child loses appetite and is generally off colour.
Stage 2.—Weakness of the legs and feet, often enough to impair walking.
Stage 3.—Headache and double vision.
Stage 4.—Convulsions, blindness and then death.

Do not forget that even without these early signs, a child can suffer the grave delayed effects of lead poisoning, with chronic nephritis later in life. So don't wait for symptoms before carrying out the protective steps outlined here.

What Parents Can Do

Make sure the paint you buy for any surfaces within possible reach of children is free from lead. To ensure this, read the label carefully, and as a further assurance, ask about it when purchasing.

If you are employing painters or a painting contractor, discuss the observance of the regulations concerning lead paint.

Suspect old, powdered paint, and get advice about it from your health inspector. All powdered and peeling paintwork should be repainted if at all possible. The old paint should be removed first.

Get advice also about brightly painted furniture and especially any greens, yellows and oranges, within reach of the children.

Do your best to stop children from chewing or sucking painted surfaces. Explain to older ones the danger of drawing on powdery paint walls, and teach them to wash their hands immediately they become powdered at any time from old paint.

Get your doctor's advice about nail-biters and thumb-suckers.—*Queensland Health Education Council.*

How to handle your show exhibit

By J. PARK, Organiser,
Junior Farmers' Organisation.

Show time is coming round again and this usually means exhibit time for Junior Farmers' Clubs. In the belief that most show societies are anxious to permit clubs to erect the best possible type of display, these few suggestions are offered as a guide:

Your exhibit should have some definite purpose; preferably only one idea should be highlighted, with details reduced to a minimum. Consider your exhibit as a shop window, and the public as the people to whom you wish to sell something—in this case, an idea. If you fill your window with a mass of different vegetables, fruits, grains, fodders, preserves, cookery and needlework, the effect will be to confuse your viewers. Present only striking material which will draw attention, stimulate imagination, and lead people to think.

Planning your exhibit

The planning and preparation should be left entirely in the hands of an organiser and a small but competent sub-committee. Naturally, they should have the full support of the club members. These points should be observed:

1. The sub-committee should determine the purpose and type of the exhibit to be erected.

2. Decide what materials you will need after you have considered the schedule, the time at your disposal, funds available, location, floor and wall space of the exhibit.

3. Decide what methods you are going to use to attract attention to and retain interest in your exhibit. (Remember that the sights and sounds of other attractions at the show have to be overcome.)

4. Make a rough drawing on a large sheet of paper of the space available for your exhibit. Mark on the plan the details of your display. Show the plan to club members and invite their suggestions for improvement. Prepare this plan over several weeks—you will find that continued thought about it will lead to improvement. Finally, draw the exhibit to scale—if necessary make small models of the background, panels, cases, shelves, pillars, pictures and so on. Mark in on the final drawings the detailed arrangements of all materials and the wording of your charts and labels.

5. Draw up a list of the materials required for the exhibit; determine which can be supplied by members and which will have to be purchased. Keep an accurate record of costs.

6. It should be clearly understood that the advice of experts should be freely sought as the exhibit is being planned. If the central idea deals with any subject relating to the farm or home, consult specialists for their ideas, and ensure that the information you present is authentic and up-to-date.

7. In constructing the exhibit ensure that the viewers' eyes are attracted to those sections of the exhibit which are most important. This "eye guidance," as it is called, should be achieved by the use of continuous or broken "lines" within the exhibit itself, pointing to the centre of interest. Try to avoid using too many arrows or ribbons in your exhibit—rows of objects, or groups of words lettered in the same colour act as guides which the eye will naturally follow. Make sure that the "lines" in your exhibit do not break it

up into a number of separate sections, or if there are sections to your exhibit "tie" them together with some natural connecting link.

8. Do not be afraid to use captions or title signs, and make them stimulating. They should serve the same purpose as headlines in the newspaper, and if they contain agreeable recommendations, they will lead the viewer to investigate further.

So, in brief:

Use your exhibit to "tell" the public something rather than merely as a display.

Limit your exhibit to the portrayal of one central idea.

Think up some "new" idea for your exhibit each year, and give members a chance to illustrate to the public what their organisation is really doing.

Recipe Of The Month

Sauce Mornay

(For Steamed or Boiled Fish)

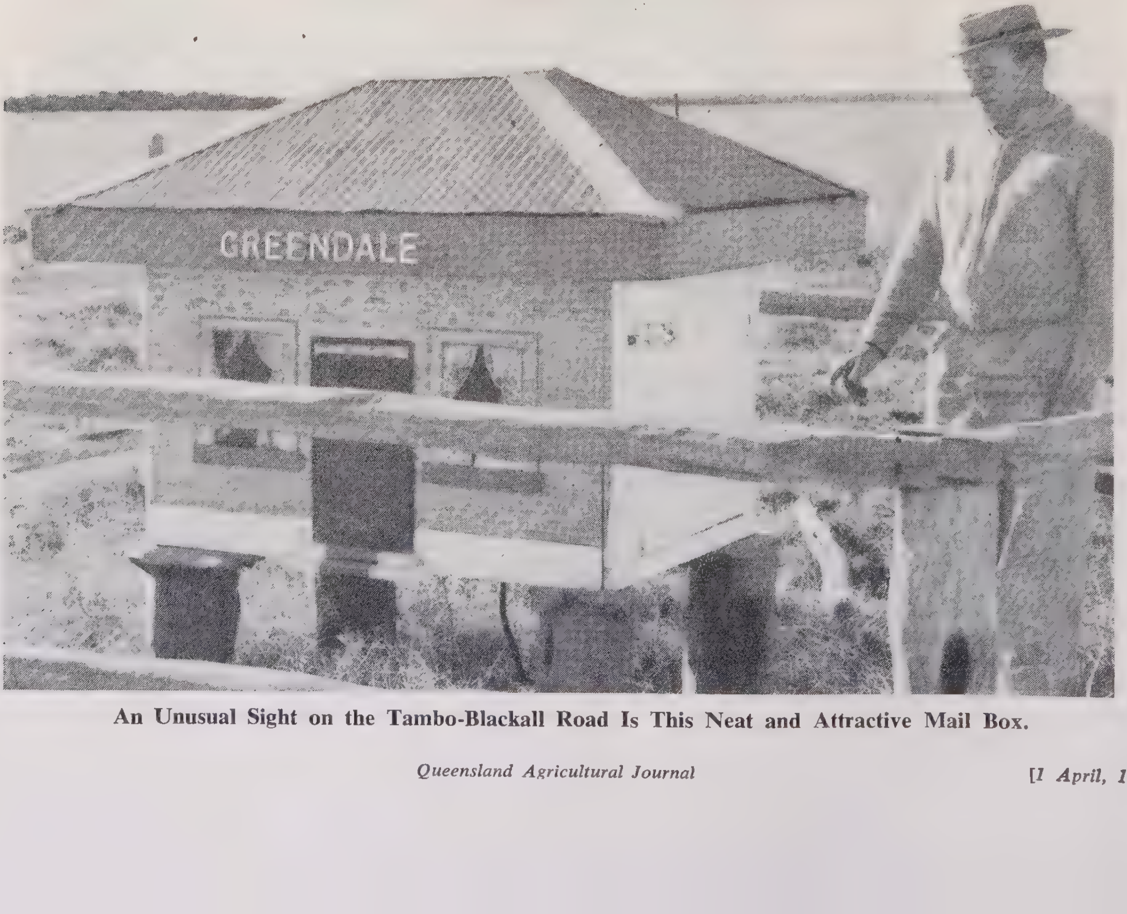
Ingredients:

1 tablespoon butter
1 tablespoon (heaped) of flour
1½ cups milk
1 heaped teaspoon grated parmesan cheese
½ teaspoon salt
½ saltspoon pepper
¼ saltspoon grated nutmeg
1 yolk of an egg

Method:

Melt butter in saucepan, stir in flour with wooden spoon after taking off stove. Add milk and stir in salt, pepper, nutmeg. Put on stove and just bring to boiling, stirring to avoid burning. Take off stove. Add cheese and egg yolk. Put on stove for 2 minutes, stirring all the time. Serve hot by pouring sauce on fish. Garnish with parsley.

* * *



An Unusual Sight on the Tambo-Blackall Road Is This Neat and Attractive Mail Box.

GLYCINE—

A Pasture Legume For Queensland

By G. H. ALLEN, Senior Agronomist.

Over the years much has been written about the value of legumes in pastures, and the need to obtain suitable species for Queensland conditions has been repeatedly stressed. Some useful legumes have already been tested and proved by the Queensland Department of Agriculture and Stock. Special attention is now directed to glycine, a legume which seems likely to play a useful part in the improvement of pastures in many areas on the coast and in some of the beef fattening districts of the State.

Plate 1

Glycine in Combination with Kikuyu Grass at the Kairi Regional Experiment Station.

Glycine (*Glycine javanica*) is a creeping, vine-like perennial which though slow in early growth has continued to produce well for at least nine years at the Kairi Regional Experiment Station.

Growth is prolific during the late spring and summer months and some production occurs in areas with mild winters. It is susceptible to frost and although leaf shedding follows low temperatures, regrowth occurs from stems and from the butt of the plant.

The species establishes readily from seed sown in autumn, spring or summer—depending on locality—it nodulates well and nodules occur on the main roots and on roots which develop readily from nodes on the vines when in contact with the soil.

Glycine is highly nutritious and though not extremely palatable it is well grazed by all livestock.

It combines well with a number of grass species and the benefit of the legume is clearly evident by more vigorous grass growth.

It seeds prolifically in northern areas and seed yields of up to 300 lb. to the acre have been obtained.

Early Development

Glycine was introduced and grown by officers of the Department of Agriculture and Stock at the Bureau of Tropical Agriculture, South Johnstone. In 1947 seed was distributed for plantings on the Atherton Tableland, and one area was planted for a comparison with centro and other tropical legumes growing at the Kairi Regional Experiment Station.

Plate 2

An Ungrazed Stand of Glycine Yielding 9 Tons of Green Material to the Acre.

Experiments were commenced in an area sown in 1949 and production from the glycine planting is still favourable and has greatly exceeded the other legumes in the trial. Though ungrazed, this stand carried 9 tons to the acre of green material in the August-December period (see Plate 2).

Heavy frosts in 1949 showed that heavy foliage loss could occur. However, stems and branches were not adversely affected by frost and regrowth was highly productive. Frost damage is not so serious in mixed pastures as the grass component affords some protection.

It was obvious that glycine had considerable value on the Atherton Tableland but testing of pasture combinations in larger areas was limited by seed supplies. A small amount of seed was harvested by hand.

In 1950, plantings were made at the Ayr Regional Experiment Station where it was hoped rapid growth would occur in the humid summer wet season to provide a large seed crop for harvesting in the following dry spring.

Growth and production at Ayr and in the Burdekin Valley districts have been excellent but do not surpass centro (*Centrosema pubescens*), the valuable legume component for pastures in frost-free high rainfall areas.

Seed Production

However, the Ayr results indicated that seed production was excellent and a number of studies were undertaken to develop methods of production. Trials to develop machine-harvesting of the seed crop were undertaken by Mr. Verhoeven and other officers at the Ayr Regional Experiment Station.

This work has been reported in the February 1958 issue of the *Queensland Agricultural Journal.*

The glycine plant flowers profusely in June and July and pods ripen during September. Harvesting of fully formed but green pods will produce viable seed so it is not necessary to wait for all pods to dry in the field. Shattering occurs as they mature and much seed can be lost.

Plate 3

Seed Pods on Glycine at Time of Harvesting.

Glycine seed is much larger than lucerne and about 73,000 seeds make up 1 lb., as against 216,000 for lucerne and 81,000 for linseed. Under favourable growing conditions, seed yields of 200–300 lb. to the acre have been obtained by machine harvesting at the Ayr Regional Experiment Station.

Experimental results and the practical use of glycine in dairy pasture have fully justified strong support for more widespread use of this legume, especially on the Atherton Tableland and areas of similar soil and climatic conditions.

In seeking to assist the development of this legume, seed has been distributed to a number of growers and is now produced at the Regional Experiment Stations at Millaroo, Ayr, Kairi and Biloela.

It is unlikely that large quantities will be on the market for some years but small quantities will be available, especially for potential seed growers.

Farmers located near the experiment stations may inquire from the officer-in-charge, and at a suitable time visit the centres during the August–November period and collect seed from established areas of the legume.

In this way it is hoped that glycine will come into general use more rapidly and that greater benefit to northern pastures will result.

Apart from direct heading of seed, the legume can be mown before harvesting. A flail type forage harvester has also been used successfully. With this machine the whole plant is harvested when seed is fully formed, the material is dried and the seed removed by threshing through an All Crop Combine (see Plate 3).

For farm plantings, the chopped glycine as harvested could be broadcast or it could be dried before planting. This method saves cleaning, and the chopped leaves and stems permit easy distribution of the seed.

From one area harvested in this manner, 120 three-bushel bags of flail-harvested dry material yielded 140 lb. of glycine seed.

Further articles on glycine seed production and pasture management will appear in future issues of this Journal.

Label Poison Bottles Correctly!

By P. D. RANBY,
Veterinary Officer.

Two dead cows have impressed a Brisbane district dairy farmer with the need to label poison bottles fully and correctly. Loss of two cows is a big price to pay for the time it takes to put the right label on a bottle of poison!

This man's experience, unfortunately, is all too common in Queensland.

Last year the deaths were investigated of two cows from a herd of 20 milkers. Both cows had died on the same day after 12 to 24 hours' sickness. The cows were in good condition and had been milking well.

A post-mortem examination indicated that the animals had been poisoned. The owner discounted the possibility of arsenic, the commonest cause of stock poisoning, as he used another preparation for tick control. His theory was that thornapples were responsible as he had seen his cattle licking and eating the thorns.

An inspection showed that the thornapple plants were dying. The grass around each bush also was dead. The farmer explained that he had sprayed them with weedkiller from a bottle that had been in his dairy for many years. As the original label had fallen off the bottle, he had re-labelled it "weed-killer."

Chemical analysis of the residue in the bottle as well as the organs and paunch contents of the dead cows showed that arsenical weed-killer from the bottle caused the deaths.

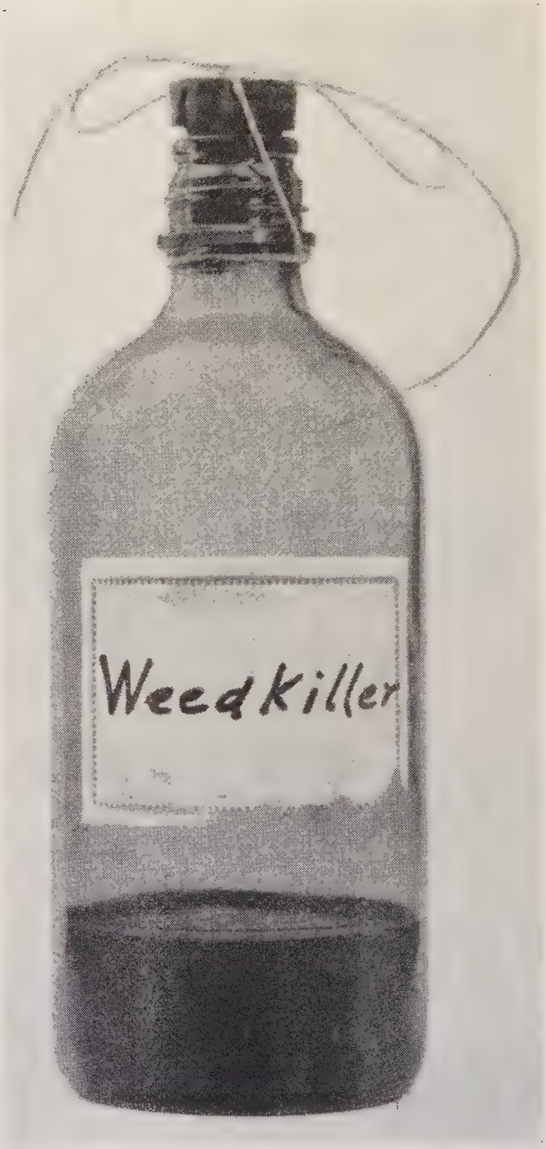


Plate 1

This Was the Bottle Labelled by the Farmer. Because there are poisonous and non-poisonous weed-killers, this bottle's label should have been marked "Poisonous Weed-killer (Arsenic)".

Mistakes in handling farm poisons, especially preparations containing arsenic, have been responsible for thousands of stock losses over the years. Always label poison containers fully and clearly, and when you spray with arsenical weed-killers, shut your cattle out of the treated area.

Buying A Farm?
Then Be Guided By Tax Returns

By E. O. BURNS, Agricultural Economist.

"Will the net income be sufficient to justify the purchase price?"

This is the question which every prospective buyer of a farm property asks himself. In some cases he takes a chance without waiting for a satisfactory reply—and his headaches begin!

The logical starting point in a financial appraisal of any business being sold as a going concern is in the books and accounts of the business. Farmers, however, are not noted for the completeness of their accounting records. Some have their accountants prepare annual Profit and Loss Accounts and Balance Sheets, but on most farms, taxation returns are almost the sole guide to the year's operations.

Taxation returns are not designed to show net income and profit in a business or accounting sense, but with a little adjustment, they can be made to serve the purpose.

The object of this article is to show a prospective buyer how to analyse the farm as a business proposition if he has access to the owner's taxation returns. The same principles can of course be adopted by any farmer who wishes to analyse his own business.

Average Returns Over 3 Years

If you are thinking of buying a farm you will need to average at least the last three years' returns. Farming is an up-and-down business, and one year's figures could be quite misleading.

The first thing is to ascertain the gross income from the farm. This will be found on Page 2 of the taxation return, Item 5 at the bottom of the first column.

For farm expenses (other than depreciation), you will find in the second last line of the second column, Item No. 33, "Total Business Deductions." Take away from this figure the following items:—

(1) *Interest paid on borrowed money* (Item 21).—You will have your own capital costs which we will look at later. In the meantime, this is one of the present owner's problems and has nothing to do with a prospective buyer.

(2) *Depreciation* (Item 22).—This is deductible at concessional rates for taxation purposes, but more realistic rates should be used for our purpose.

(3) *Primary production expenditure* (Item 30).—This is capital expenditure and not a current cost.

Depreciation can be calculated with sufficient accuracy in the following manner: You will undoubtedly have a list of assets and the values at which it is proposed to transfer them. If you are satisfied with these valuations take 10 per cent. of the value of plant and machinery, and 3 per cent. of the value of structural improvements, such as buildings and fences.

Add this figure to the other costs and you have Farm Expenses. There is one point to be noted here. This method assumes that depreciation has been the same for three years or whatever other period you are going to average. This will not be too far out unless there have been big changes in the assets during this period. In any case, there is seldom any alternative to this, as the assets will not have been valued annually except for taxation purposes, and these are useless because of the 20 per cent. depreciation provisions.

Farm Income

By deducting Farm Expenses from Gross Farm Income we arrive at a figure which is called Farm Income. This is the reward for capital and the farmer's own labour, and is the key figure in a farm financial analysis.

The following example assumes certain gross incomes and costs for the last three years and shows the calculations up to this point:

	1956-1957 £	1957-1958 £	1958-1959 £	Average £
Gross Income from Farming (Item 5) ..	3,100	2,740	2,860	2,960
Business Deductions (Item 33)	2,410	1,540	2,200	
Less Interest (Item 21), Depreciation (Item 22) and Primary Production Expenditure (Item 30)	842	600	1,090	
Net Deductions	1,568	940	1,110	1,206
Depreciation (10% plant, 3% structures) ..				420
Farm Expenses				1,626
Farm Income (Gross Income minus Farm Expenses)				£1,274

In this example, the Farm Income averages £1,274 per annum. Out of this has to come compensation for your own labour and interest on your capital.

Suppose the farm was being offered at £13,000. What would be the position if you bought at this price? At 5 per cent. you would want your capital to earn £650.

	£
Farm Income	1,274
Interest on Capital ..	650
Reward for own Labour ..	£624

This would leave £624, or £12 per week for your own labour. This is less than the Basic Wage and probably at least £3 a week less than you can earn now without the worries of farm management.

Suppose you value your own labour at £15 per week, or £780 per annum.

	£
Farm Income	1,274
Own Labour	780
Return on Capital ..	£494

This would leave £494 as a return on your capital. If you expect your capital to earn 5 per cent., this would make the value of the farm to you £9,880.

$$\frac{\pounds 494 \times 100}{5} = \pounds 9,880$$

If the farm were bought for £13,000, the return of £494 works out at 3·8 per cent. You might be reasonably happy with this return if you had no need to borrow money to buy the farm. The return is not so high as for gilt-edged investment, but you might consider there are compensations.

If You Have To Borrow

The situation could be a lot worse if you have to borrow money to buy the farm. In this case, interest charges will have to be met, and they will almost certainly be higher than 3·8 per cent.

Assuming you bought the farm for £13,000, with £3,000 of your own capital, and £10,000 borrowed at 6 per cent. In this case, interest on borrowed money will amount to £600. This is an actual cost which will have to be paid out of the farm income. In our example, this would leave £674 per annum, which is less than the Basic Wage. Repayments of your loan would have to come out of this £674, and you would be getting no return at all on your own £3,000 sunk in the farm.

This example has been given to draw attention to some of the economic factors that should be borne in mind when considering farm purchase. There may be, and frequently are, other factors which would justify taking a risk.

The owner may be a poor farmer, or may be getting on in years. If this is so, you may feel justified in increasing your estimate of farm income. It is safer, however, to be conservative rather than unduly optimistic, even to the extent of reducing the estimate should you, for example, feel you are less experienced than the owner.

Farmers' Questions

Phasey Bean.—The use of phasey bean in pastures has been the subject of many recent inquiries.

Answer: Phasey bean is a useful legume which has a perennial root system and annual tops. It may grow to a height of 3 to 5 ft. and has an upright branching habit. When young, the leaves are a bright green to mid-green in colour and are usually slightly glossy on the top and dull underneath. As the plant ages, the leaves turn a darker green colour.

The flower heads are borne on the tops of the branches and the flowers are usually mid-purple in colour, pea shaped and may reach about ½ in. in diameter. After flowering the plant sets seed and the pods may reach about 4 in. in length and are usually about ⅛ in. in diameter. The seed is about half as long again as it is broad and is usually a dark mottled greenish brown in colour.

Phasey bean is a useful forage plant though, due to climatic condition, soil type or when young, it may occasionally be unpalatable to stock. Nevertheless, phasey bean is very useful in rain-grown pasture mixtures and is usually quite readily eaten by stock.

In coastal districts phasey bean is subject to bean fly damage which may seriously reduce seedling regeneration of this legume in subsequent years.

Nematodes can also be troublesome when this legume is planted in sandy soil.

In common with most legumes, phasey bean is a useful soil builder, and due to its high protein content it helps to raise the nutritive level of the pastures.

Machine harvesting is now being undertaken but care is necessary when harvesting, as the pods split open readily, and as they split, the two halves curl with a quick twisting action which throws the seed over a large area. Hand harvesting is also undertaken and at present seed is readily available at approximately 22s. a lb.

Planting rates vary from as little as 2 oz. to the acre in inland districts, to 1 lb. to the acre in coastal areas. These seeding rates will usually ensure a good stand in subsequent years.

Toowoomba Canary Grass.—Several inquiries have been received recently about Toowoomba canary grass (*Phalaris tuberosa*).

Answer: Toowoomba canary grass is a valuable constituent in irrigated pasture mixtures for many parts of Queensland. As it is a native of the Mediterranean region it is not readily adapted to growing under Queensland conditions without the assistance of irrigation.

The grass is a deep-rooted perennial which produces short underground runners. During the winter and spring months this grass produces a good sward of palatable nutritious leafage. Under grazing conditions it produces only a limited number of seed stalks.

Phalaris tuberosa does best on a deep fertile well-drained soil, but is adapted to a fair range of soil types. It has a high nitrogen requirement and should be planted in soils having good nitrate levels.

Planting should be done in the aumumn at the rate of 4 lb. of seed to the acre in association with legumes and grasses. It is highly desirable to allow this grass to become properly established before grazing is commenced. During the early stages of growth it is very sensitive to competition as it takes a fairly long period to establish its root system.

Is A Used Milking Machine A Good Buy?

By J. D. ELRINGTON, Senior Adviser (Machinery)

It might be all right to go shopping for used milking machines, so long as you examine carefull before buying. This article tells you what to look out for.

Last year there were a large number of used milking machines installed on Queensland dairy farms, in fact, 41·5 per cent. of all the notified installations were used machines.

These were obtained from dairies which had ceased to operate, and from dairies in which new machines were installed. Unless care was shown in these purchases and the machines examined expertly for serious faults and inefficient operation, it is certain many producers bought themselves trouble.

A recent case was brought to notice of the Department. Because of a faulty pump, revealed following his purchase of a used milking machine, the buyer eventually had to appeal to a dairy machinery firm for help.

Fortunately he was able to buy replacements at a very reasonable price, but even so, when the cost of transporting and re-fitting the machine was added, the total cost was then more than the price of a new machine.

Good used machines, are, no doubt, available at a price much below that for a new article, and the man who can take advantage of this is fortunate.

However, it should not be assumed that every purchase is a bargain. Here are some of the things which can be done to ensure that a used milking machine is a wise investment.

Replacement Parts

It is not a sound practice to buy a used milking machine if the manufacturer or the agen in this State is no longer in business, does no sell milking machines, or has changed the mak of machine handled by him. Be sure that part and service are available. The machine may b a discontinued line, so an effort to discover a identification for it (such as the name or numbe given it by the maker) followed by a 'phone ca or letter to the agent to find out if parts ar available, could save unnecessary expenditure.

All Present and Correct

Before proceeding to examine each part, b satisfied that all the parts are there. A set o cups, a claw, or a pulsator drive bracket may b missing. Find out (*a*) if the releaser was on th right- or left-hand end of the machine, an (*b*) the width of the bails. Some machines ar easily altered from right- to left-hand deliver and vice versa, while others are difficult to insta in the opposite direction.

If the original bails were narrower than thos in which the machine is to be fitted, or if th sight glasses and milk taps were attached to th milk line and have to be moved, it is possib that new milk and air lines would be required.

If you are not able to fit the machine, make sure you can obtain the services of a competent milking machine fitter before you buy.

Examine These Parts Closely

The parts to be carefully considered and closely examined are the vacuum pump, pulsators, pulsator drive, relief valve, vacuum gauge, interior surfaces of lines and rubberware.

Vacuum Pump.—Without the aid of an air-flow meter to check accurately the air-pumping capacity of a pump, the customer can only look at the outside of the pump and notice how much oil and dust is stuck to it. This tells him nothing —nor does the age of the pump tell him anything. Some very old pumps have shown themselves under test to be as good as new ones, and conversely there is an odd pump less than 12 months old that has been worn out.

Tight drive belts, grit, dirt and milk, as well as lack of or incorrect lubrication can quickly ruin a pump.

Any used milking machine should be bought with the thought that the pump may require servicing. This could cost between £12 and £20 for reconditioning. When the machine is installed into the new premises and working, the local Dairy Officer will be pleased to test it with an air-flow meter.

Pulsators.—Being a used machine, the pulsators are almost certain to show some wear. The type which consist of a hollowed-out block of metal, plastic or carbon, driven by a reciprocating rod and sliding back and forth on a metal base, are the most common. Examine the base, and if it is not perfectly smooth, that is, if it has any "humps" or ridges on or in it, allow the cost of refacing in the purchase price.

Refacing consists of filing and hand grinding and polishing to a perfectly smooth flat surface again.

The base of the moving block should also be smooth, flat and even, and if the block has been worn excessively the depth of the hollow in its base may not be sufficient to allow the free passage of air from the space behind the inflation in the teatcups, to the vacuum pump.

The more sets of cups per pulsator the more generous the hollow needs to be. There is no point in having it exceed the size of the pulsator ports or the size of the air line, which in some cases is ½-in. tube.

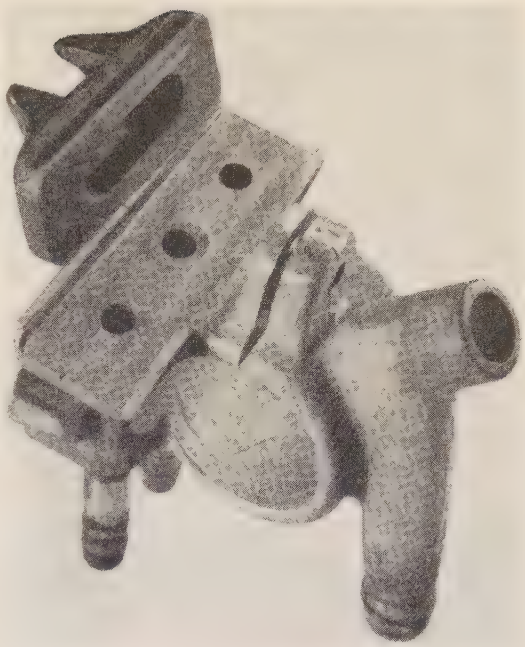


Plate 1

A Pulsator Like This One Has Been in Use for a Long Time and Refacing is Now Required.

Pulsators have been observed which were so badly worn as to be almost flat on the under surface, leaving practically no space for the air to flow freely from one port to another.

Pulsator Drive.—A careful check of shafts and bearings, belts and elbow joints for wear would be advisable. Worn elbow joints could make pulsator adjustment impossible. Cast-iron V pulleys are generally satisfactory, but aluminium ones wear on the sides of the V, allowing the belts to run on the bottom of the groove. This results in belt slip, and pulleys in this condition require replacement.

Relief Valve and Vacuum Gauge.—The relief valve will probably need a thorough cleaning before it can be inspected. The valve and the valve seat should be smooth and shiny, free from rust and mechanical damage. The spring should also be free from rust, and when compressed and/or expanded by hand should return to its original position.

The vacuum gauge can be examined by sucking with the mouth after thoroughly cleaning the threaded end of the gauge. It should be possible to suck up about 18 in. vacuum in easy stages using the tongue to assist. Suck out air until an initial 3 or 4 in. have been obtained, and place the tongue over the hole. Take a breath and repeat the process. The needle should rise easily and smoothly. Tapping on the body of the gauge with the forefinger should not alter the position of the needle (pointer).

Lift the tongue slowly, and allow air to seep past into the gauge. The needle should move slowly and smoothly to the zero mark. Any jerking or irregularity and any "zero error" means the gauge cannot be relied upon and it should be rejected.

Interior Surfaces.—"The Dairy Produce Acts, 1920 *to* 1959," require all copper, brass, iron and similar surfaces over which milk flows to be completely covered by a layer of tin or smooth nickel plating. Chrome plating in such places is an infringement of the Health Acts. It is also necessary for persons installing a milking machine or an engine to drive a milking machine, new or used, to notify the Division of Dairying of the Department of Agriculture and Stock of any such installation. Among other things, this is required so that faulty or unsatisfactory equipment is not installed.

Dairy Officers have been known to prohibit the installation of milking machine parts through which milk flows, the reason being that the tinning or plating had worn off. In one case the farmer found it necessary to buy a new milk line. If the tinning or plating has worn off the inside of the releaser, be suspicious of the milk pipes also. It is difficult to examine a milk pipe without some experience of the internal appearance of untinned lines. Therefore, be extremely cautious when examining used machines for tinning faults.

The downdrops should not be bent, the claws should be in good condition and free from repairs, and the teatcup shells and rings should still be in their original shape and not corroded with rust. Any sharp edges in the teatcups will cut the inflations, and if the mouth of the cup is not perfectly circular, the mouthpiece ring cannot fit properly to make an airtight joint. An air leak anywhere between the mouth of the teatcup and the pulsator will cause faulty pulsation in one set (or all sets, depending on the type of pulsation system) of cups, resulting in slow milking and possibly mastitis.

Rubberware.—Generally a used milking machine will require complete refitting with new rubberware. Soiled, cracked and sticky rubber cannot be successfully reclaimed, so an allowance for new rubber should be made when considering the fair price for a used machine.

It is obligatory to notify the Dairy Officer of intention to install a machine or engine, and this applies whether the machine is new or used. A used machine must pass his inspection, and it would be as well to obtain approval to install before commencing the work. This approval could save much additonal work.

These few pointers indicate how important it is to examine used milking machines carefully before purchasing them.

Equipment for Testing

The Queensland Dairymen's Organisation through the dairy associations, has provided special equipment for testing the efficiency o milking machines and vacuum pumps, and thi is available to producers on request. Mos machines cannot be checked until they are installed and working.

In many areas the local Dairy Officer has the responsibility of using the testing equipment, and therefore a request for him to check a newly-purchased used milking machine may preven milking with an ill-adjusted and faulty machine.

And finally, those who install a milking machine of any kind should consider themselve morally bound to provide protection for childre from the motor, shafting, pumps, and so on.

Spikeleaf in the Banana

By R. L. PREST, Senior Adviser in Horticulture, and A. E. SMITH, Horticulture Branch.

Spikeleaf is the name given to a disorder in bananas which is usually only of minor importance. During the last few years, however, it has been rather widespread and in several Mons Mari plantations in 1959, loss of crop reached commercial proportions.

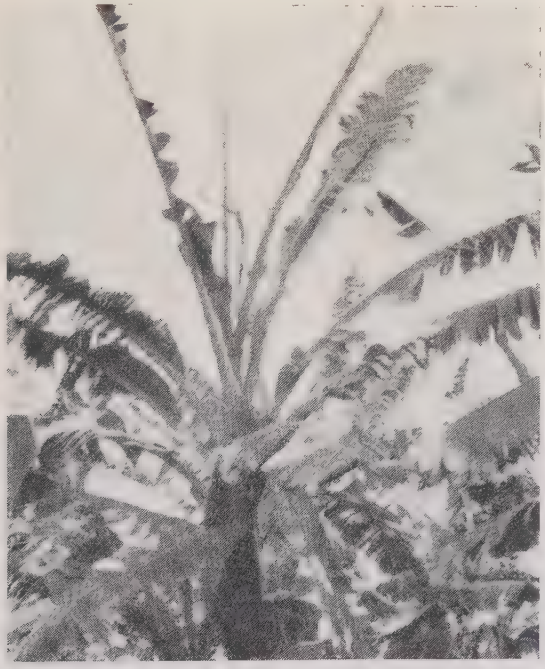


Plate 1

Mons Mari Banana Plant Showing Symptoms of Spikeleaf. Note the cluster of abnormal leaves at the crown with the leaf lamina absent or only partly developed.

The disorder makes its appearance in the October–December period but remains conspicuous much longer.

Typical symptoms of spikeleaf are the partial or complete absence of the lamina or leaf blade on either side of the mid-rib of the leaf. Several leaves—up to 18 have been recorded—may be affected on the one plant.

The term spikeleaf is an apt description of the disorder in large plants with five or more affected leaves; the bare or almost bare mid-rib extend outwards and upwards from the crown and resemble spikes.

No Bunch in Acute Cases

In acute cases, normal leaf production is not resumed in summer and no bunch is thrown.

Plants with several affected leaves may subsequently produce normal leaves and mature a bunch but its size will be reduced.

Plants with only a few leaves showing spikeleaf symptoms may recover and produce both normal leaves and a normal bunch.

When affected plants are cut down and the pseudostem dissected, unfurled leaves which have not yet reached the throat of the plant show abnormalities in shape comparable with those of the adult spikeleaves. In addition, browning of the upper surface of the mid-rib is apparent. This discolouration may involve the tip of the unfurled leaf. Sometimes, a wet rot supervenes and the young leaf and/or bunch is unable to force its way up through the stem. When this happens, no further development of the plant can then take place. The discolouration may extend back into the corm itself.

Sucker growth from spikeleaf plants is normal.

In Caboolture District

Spikeleaf has been reported in several plantations near Caboolture during the past few years. The disorder is not confined to particular districts, however, nor to particular plantations.

The more spectacular outbreaks have occurred in irrigated plantations on the lower foothills of what is normally classed as forest country in which the soil is typically shallow and only moderately fertile. In non-irrigated plantations, spikeleaf is much less common than in irrigated plantations on similar soil types and in similar locations.

Sometimes the disorder follows the path of one or more spraylines used for irrigation in the plantations.

Association with Climate

Spikeleaf appears to be due to cold injury at the apical meristem of the corm when the leaf initials of the affected leaves were laid down in winter or shortly afterwards. At the time of leaf initiation, these tiny embryo leaves are rolled one inside the other at the tip of the corm near ground level.

The seasonal incidence of the disorder indicates that chilling of the corm during the winter months is the primary cause of spikeleaf. Nevertheless, field observations suggest that strong winds, soil erosion and other factors which injure the roots and slow down the rate of plant growth tend to prolong the spikeleaf symptoms in the plantation.

Isolated cases of the disorder have been noted in leaves thrown outside the October–December period. These can usually be traced to mechanical injury to the corm caused by implements or, in hill-side plantations, by rolling stones and logs. This has no commercial importance.

Injury to the corm whether due to chilling or other causes does not become apparent until the affected structure, leaf or bunch, emerges at the crown of the plant some months later.

November Dump Fruit

The more serious outbreaks of spikeleaf occur at or about the time that November dump bunches make their appearance in southern plantations. Such bunches are characterised by few hands, less than the normal number of fruits to each hand and "dumpy" fruit. These bunches are initiated in the corm of the plant in the July–August period and the phenomenon is ascribed to chilling at the time the bunch initials were laid down or shortly afterwards.

While spikeleaf seems to be another expression of winter chilling, the frequent association of spikeleaf symptoms with the more vigorous plants suggests that rapid growth before low temperatures is an important predisposing factor to injury.

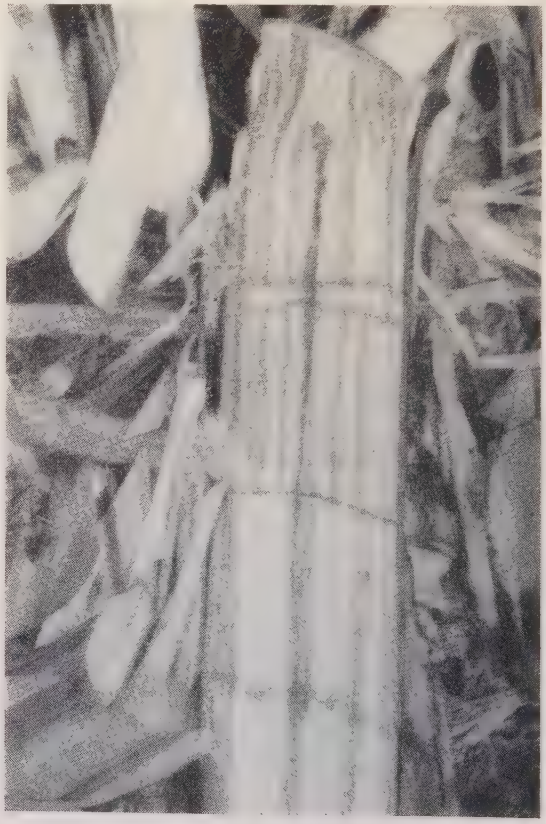


Plate 2

Stem Section (part) of Banana with Spikeleaf. Tissue breakdown has occurred at the tip of the undeveloped leaf within the stem. When this occurs the plant cannot resume normal growth.

In irrigated plantations, land is selected for planting close to the water supply and, in practice, the plantation is usually sited on the lower foothills where chilling risks are greater than farther up the slope. In some plantations, the safe lower level for banana production has already been reached, if not exceeded. Nevertheless, many growers consider that the advantages derived from irrigation under marginal climatic conditions outweigh hazards such as proneness to spikeleaf.

It is worth noting, too, that fertilizing in irrigated plantations is invariably more liberal than in non-irrigated plantations and treatment schedules aim at keeping the dormant period in winter as short as possible. Fertilizers, therefore, are used in conjunction with irrigation to delay the onset of dormancy and to promote an early resumption of growth in spring.

Possible Remedies

The typical characteristics of the disorder suggest the adoption of certain precautionary measures in plantation management, at least in districts where spikeleaf has occurred or, by reason of location, is likely to occur. These are:

1. Select land for bananas with a warm slope, preferably with a north-easterly aspect.

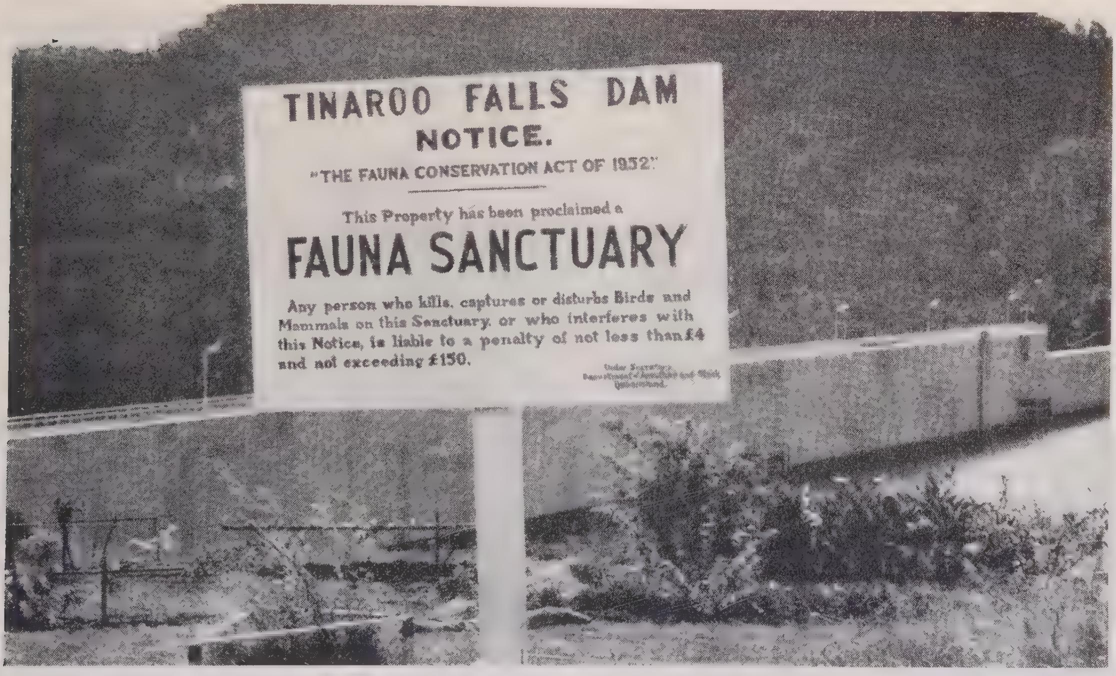
2. Avoid planting at low elevations, especially on land where timber and other topographical features tend to impede the movement of cold air down the slope and away from the plantation.

3. Do not apply fertilizers, particularly those high in nitrogen, from the middle of April to early September. Plants making lush growth when a sharp drop in temperature occurs are very susceptible to cold injury.

4. Avoid over-watering during the cooler months of the year, especially on the heavier-textured soils which are normally classed as "cold."

* * *

Fauna Conservation In Action


TINAROO FALLS DAM
NOTICE.
"THE FAUNA CONSERVATION ACT OF 1952"
This Property has been proclaimed a
FAUNA SANCTUARY
Any person who kills, captures or disturbs Birds and Mammals on this Sanctuary, or who interferes with this Notice, is liable to a penalty of not less than £4 and not exceeding £150.

A Fauna Sanctuary Notice at the Newly Constructed Tinaroo Falls Dam Warns Against the Killing, Capturing, or Disturbing of Fauna in the Area.

Breeding Fast Feathering Into Chickens

By B. W. MOFFATT, Poultry Adviser.

This article shows how to select chickens for fast feathering, which is a requirement of modern poultry breeding.

Fast feathering chickens are essential for the broiler grower and desirable for the egg producer. Some breeds of fowls such as the White Leghorn are fast feathering, but others such as Australorp, New Hampshire, and Light Sussex are not. Experiments conducted on a farm in the Brisbane area and at the Poultry Section of the Rocklea Animal Husbandry Research Farm have now demonstrated that it is a simple matter to improve the rate of feathering in these breeds and make them fast feathering.

Why should the rate of feathering of chickens be so important? Here are some reasons:

- Table birds are being slaughtered as young as eight weeks. If they are slow feathering, the presence of pin feathers makes the work of plucking more difficult and the carcass less attractive.
- Fast feathering chickens are fully feathered at an early age and so the incidence of cannibalism in the flock is reduced because there are no bare areas of the body for other birds to pick.
- Chickens with a full covering of feathers are better able to withstand sudden drops in temperature, because of the insulating effects of the feathers. Their feed conversion may also be improved slightly because they do not have to expend so much energy in maintaining their body temperature.
- It is possible that the incidence of breast blisters is lower in fast feathering broilers because of the cushioning effect of the feathers on the breast.

These are sufficient reasons why our breeders should improve the rate of feathering of their flocks. Fortunately the work can be handled by them after they have acquired a little practice

Breeders of Australorps or New Hampshires will have noticed that while some chickens are fast feathering others are very slow. Often cockerels are seen at four weeks with practically no feathers except on their wings. These are the typical slow feathering birds. Their fast feathering penmates will be fully feathered soon after five weeks. Any flock that contains at least some fast feathering chickens can be selected to breed true for this character.

How to Select

Once the birds are fully grown it is impossible to determine which are fast feathering and which are slow. For this reason selection has to be made while the chickens are young and still exhibiting the differences in rate of feather growth. For ease of handling and greater accuracy it is best to carry out the selection at day-old and check the birds when they are one week old.

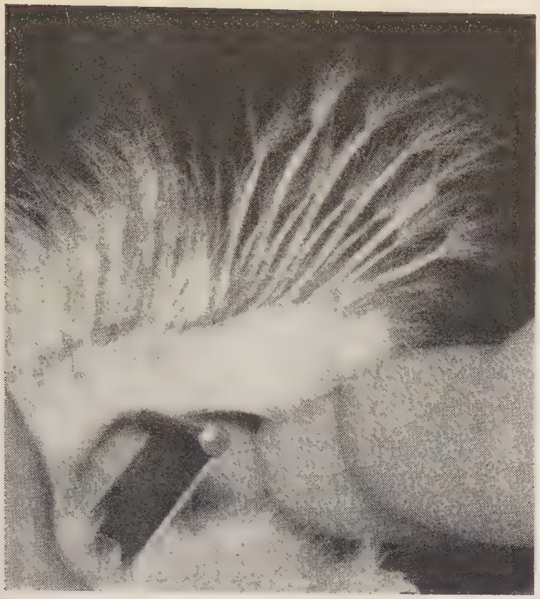


Plate 1

The wing of a day-old fast feathering chicken. Note that the primaries are much longer than the coverts.

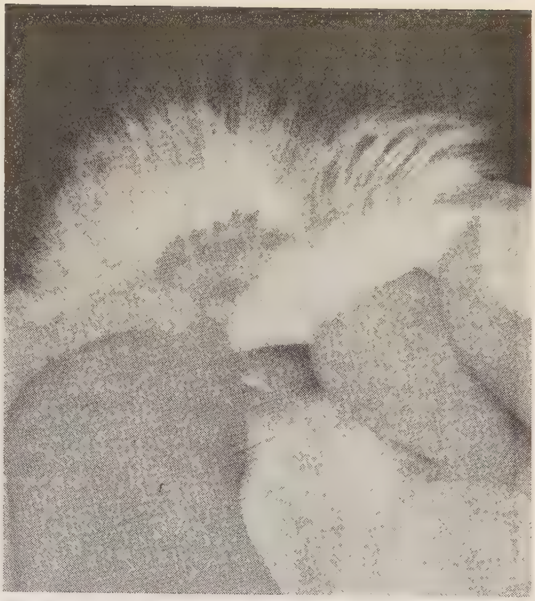


Plate 2

The wing of a day-old slow feathering chicken. Both the primaries and coverts are short and about the same length.

Inheritance of this particular character is termed "sex linked" inheritance because the pullet inherits the rate of feathering from its father and not its mother. This makes selection rather simple. Selection need only be done on the cockerels for the pullet progeny of the sires will automatically be fast feathering. However, it must be carried out for two years to ensure all male and female progeny will be completely fast feathering. It would be wise to check the third year to eliminate any mistakes that have been made.

As most hatcheries keep only a few hundred cockerels, it is not a difficult matter to eliminate all slow feathering cockerels at day old and retain only fast feathering birds. When these birds are fully grown they can be selected on other characters if desired and so the normal routine of the farm is not interrupted.

Selection at Day-old

At day-old the rate of feathering can be determined by examining the wing feathers, particularly the primaries and coverts. The primaries are the feathers towards the end of the wing that grow into the long flight feathers. The coverts are smaller feathers placed between the primaries and a little above.

In the fast feathering day-old chicken the primaries are relatively long and the coverts are no more than two-thirds the length of the primaries. (See Plate 1.) The slow feathering chicken will have coverts as long as, or longer than, the primaries which will be relatively short, as shown in Plate 2. In very slow feathering birds the primaries are hardly visible and if care is not taken the coverts may be mistaken for the primaries. When examining the first few birds it is wise to pluck away some of the down so that the feathers are clearly visible. With a little practice the operator will soon become very proficient and can easily reach 100 per cent. accuracy.

To avoid errors it is wise to check the selected cockerels at one week old. At this age the fast feathering chickens will have at least some tail feathers and their primary wing feathers will be nearly the length of the body. The slow feathering

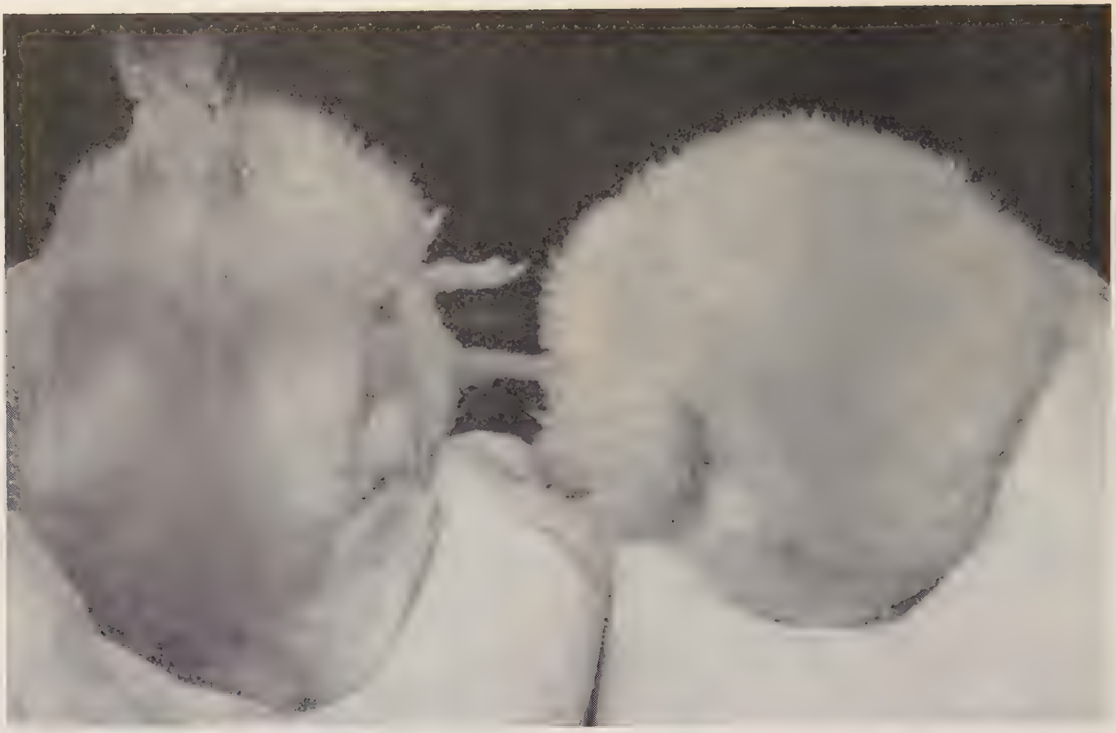


Plate 3

Both of These Chickens Are One Week Old. The fast feathering chicken on the left already has a tail whereas the slow feathering chicken has not.

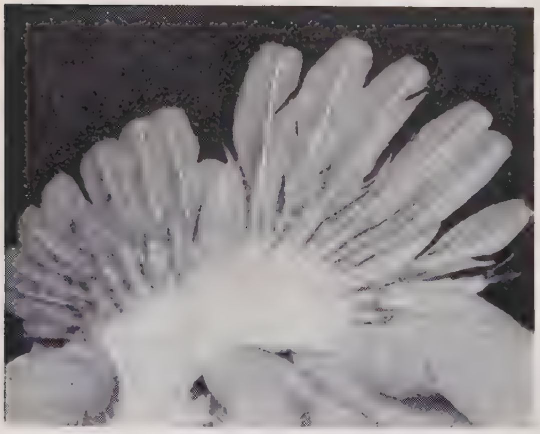


Plate 4

In the week-old fast feathering chicken the wing feathers have grown considerably. The primaries are still much longer than the coverts. Compare with the wing of a slow feathering week-old chicken in Plate 5.

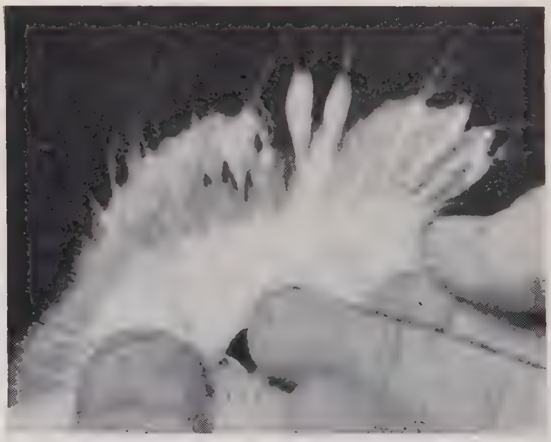


Plate 5

The wing of a week-old slow feathering chicken. The primaries and coverts are still about the same length.

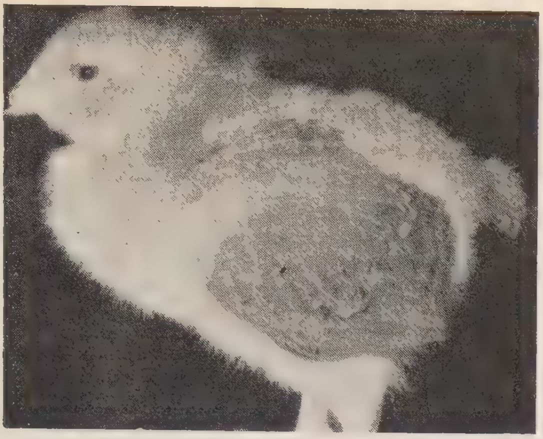


Plate 6

This two-week-old fast feathering chicken has wing feathers longer than the length of the body and a well developed tail.

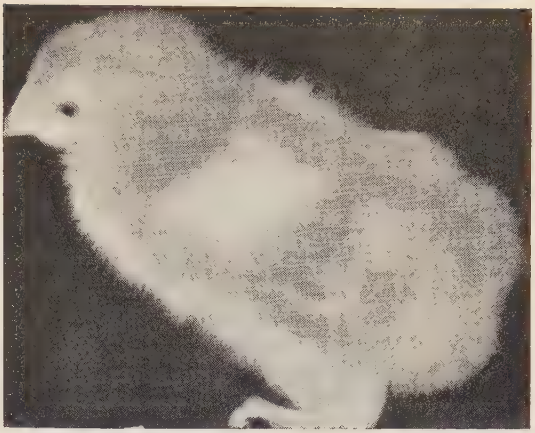


Plate 7

A two-week-old slow feathering chicken. Note the short wing feathers and lack of tail feathers compared with the same age chicken in Plate 6.

chicken has no tail feathers (see Plate 3) and only short wing feathers. If there is any doubt it is better to discard the chicken. The length of coverts in relation to primaries is also a good guide at this age. Again the fast feathering birds will have long primaries with short coverts (see Plate 4) while the slow feathering bird will have coverts and primaries of about the same length (see Plate 5).

By two weeks of age, the fast feathering chicken has a good tail, and wing feathers longer than the body (see Plate 6). He is far advanced on his slow feathering penmate, who is seen in Plate 7. At this age the fast feathering bird is beginning to grow back feathers and by five weeks or soon after, he is fully feathered.

It is a wise precaution to check the selected birds at about eight weeks, and discard any that show signs of bare backs. This bare back condition can be inherited separately from the slow feathering condition. Fortunately bare backs are fairly rare.

If this method of selection is adopted for two years then the flock will be completely fast feathering and further selection is not required. It is wise, however, to check in the third year to make sure that all chickens hatched are fast feathering.

In One Year

The flock can be made completely fast feathering in one year if the breeder is prepared to select both males and females. The selection procedure is still the same as outlined. It will be found however, that no very slow pullets are encountered. They will either be fast or intermediate between a fast and a very slow cockerel. Some of these intermediate birds will also be found among the cockerels.

The Genetics of Feathering

The rate of feathering is governed by a single gene located on the sex chromosome. The male fowl carries two sex chromosomes and so two of these genes. The female has only one sex chromosome and so can only have one gene governing the rate of feathering. The gene on each chromosome can be either K for slow feathering or k for fast feathering. As males carry two genes their genetic makeup or genotype can be any of the following:

KK	slow feathering
Kk	intermediate
kk	fast feathering

Using the method of selection outlined, the intermediate birds have been classed as slow. As the slow feathering gene K is dominant, the bird, male or female can only be fast feathering if no K gene is present. The females, as they only have one gene can only be K-intermediate or k fast feathering.

The female inherits its gene from its father only and none from its mother. The cockerel, however, inherits one gene from each parent. This explains why selection of males for two years will make the whole flock fast feathering.

It can also be clearly seen that females can never be as slow feathering as the slowest males. The female only has one gene so that two slow feathering genes can never be present. When only one is present the bird will be intermediate. However, if the fast feathering gene (k) is present, the female can feather just as fast as her brother with a genotype of kk.

The reason for checking the fast feathering birds at eight weeks of age is based on the fact that a separate modifying gene (causing bare backs) can be present which overrides the fast feathering genes.

Our Progress So Far

In Queensland the original work of selection for fast feathering was carried out on a commercial Australorp flock on a hatchery at Rochedale. The cockerels on this farm have been selected for two years and only fast feathering birds have been kept.

The difference in the rate of feathering on this farm was very noticeable even after one year of selection. This work has now proved that our Australorp flocks can be made fast feathering.

Selection has also been carried out on New Hampshires and Light Sussex at the Poultry Section of the Rocklea Animal Husbandry Research Farm. In this project both females and males have been selected. This work has demonstrated that it is possible to have a fast feathering strain in one generation. In most of the selection carried out it has been found that the original unselected flocks contained about 30 per cent. of fast feathering birds.

◆

Reduce Wear In Tractor Engines

Look out for abrasion and erosion—two of the main causes of wear in tractor engines! Long life and efficient performance depend on how well you reduce these sources of wear.

Abrasion is caused by dust getting into the engine through the induction manifold or through the crankcase ventilation system. When you think how hard it is to keep a tractor engine dust-free, you realise just how much abrasive dust is in the air.

In summer, a cubic mile of air may contain as much as four tons of dust. Each gallon of fuel a tractor burns requires no less than 10,000 gal. of air. This shows just how necessary it is to have an efficient air cleaner. A loosely-fitted cleaner or an empty oil bath will allow dusty air to be drawn into the cylinders. Then piston rings, cylinder walls and valve guides will wear excessively. These abrasives will eventually find their way past the piston rings and into the crankcase oil. In this zone, bearing wear will follow unless a full-flow oil filter is fitted.

The best air cleaners, when well maintained, have an efficiency of about 95 per cent. It is clear, therefore, that some abrasive dust is bound to get in. You can reduce this by observing two practices. The first is to service your air cleaner regularly, using the correct grade of oil. If the oil is too light or if it foams, the dust will get in. Make sure the induction manifold is tight, as leaking gaskets allow dust-laden air to reach the cylinders. The second point is to change your crankcase oil precisely as instructed by the manufacturer. Dust-laden air will grind away the life of your engine.

Erosion wear is caused by metal-to-metal contact. Provided a sufficiently rugged oil film can be maintained, metal-to-metal contact between the rubbing surfaces of the engine will be prevented. Modern lubricants have greatly reduced erosive wear. But dilution of the lubricating oil with fuel can be a source of trouble. If a kerosene tractor runs too cold or an injector fault develops on a diesel, unburnt fuel may find its way into the crankcase. This thins out the lubricant and the oil film protecting the moving parts is less effective.

—*C. G. WRAGGE, Agricultural Engineer.*

Herd Records Give Farm Guidance

Constant guidance in farm management . . . that's what herd recording figures give to successful Ayrshire breeder, Mr. T. F. Dunn, of Beaudesert.

Mr. Dunn declares that it's largely on these figures that he's built his high-producing herd. Recorded under the Agriculture Department's group scheme since 1948, his has been the top herd in its group for the last four years.

Average production of the 50 cows that completed lactations in 1958-59 was 5,909 lb. of milk containing 217 lb. of butterfat. This bettered the group average by 1,369 lb. of milk and 47 lb. of butterfat.

Mr. T. F. Dunn, a Beaudesert District Dairyfarmer, Had Good Reason to be Pleased with this 10-acre Paddock of Poona Cowpeas. He estimated that this crop would yield about 8 to 10 tons an acre. He planned to graze it with his 50-cow pure-bred Ayrshire herd.

On this milk-supply farm, the aim is to produce the same quantity of milk each month. To do this, the cows are well-fed and calvings are arranged through the whole year, with some restriction in January, February and March.

Studied, the long lists of figures that comprise herd-recording reports unfold an enlightening story of each cow's worth.

This Was A Shock

The first information Mr. Dunn got from herd recording was the identification of his best-yielding cows.

"This," he said, "was something of a shock. There are always a certain number of cows you just can't pick by observation at milking time. Cows that give the most milk don't always give the most butterfat. And often those with the lowest milk yield aren't those with the lowest butterfat."

This knowledge is valuable in feeding. The herd is fed concentrates almost the whole year, and care is taken to give the highest producers a bigger ration.

But, under the conditions on his farm, Mr. Dunn finds information on regularity of yield and lactation length the most valuable of all.

"It shows me which cows will 'hang on,' and those are the ones I want," he said. "Some of my cows give exactly the same yield for three or even four months, and the records identify them for me."

Average lactation length of this farm is 274 days, and Mr. Dunn hopes eventually to raise this to 300 days. The longest average lactation recorded was 280 days in 1956–57.

The culling programme is guided by production records. Cows marked for culling are disposed of as opportunities arise.

On this farm, the emphasis is on good feeding. Mr. Dunn believes that in his district it's best to give the herd supplementary feed from conserved or standing crops all the year round.

Can't Afford To Stop Feeding

"In the autumn and winter especially, I find it's easier to keep the milk up than to get it up once it has dropped," he said. "When the milk production goes the cows lose bodyweight too, and you have to build up their condition before you can get the milk back. On my country, I'm satisfied you can't afford to stop feeding."

Sixty acres of cultivated creek flats provide all the roughages fed on the farm. About 17 acres of lucerne are spray irrigated from a creek, but the water supply fails in a drought. Remainder of the cultivation is given over to cowpeas and maize in the summer and oats in the winter. Cowpeas are regarded highly for summer grazing, and plantings are made to provide a continuous supply of this fodder until April.

Mr. Dunn has great faith in silage as a high-quality conserved roughage. He has put silage down "off and on" for the last 10 years, but now plans to make it his major fodder conservation effort. He has bought a forage harvester and has already put 175 tons of lucerne silage in trenches this summer. With a reserve of 100 tons from a previous season, he hopes to have 400 tons available for winter and spring feeding. It is planned to ensile crops of maize, lucerne and cowpeas.

Common Weeds of Farm and Pasture

by S. L. Everist, B.Sc., Government Botanist.

A handbook that contains brief descriptions of about 110 of the common weeds of Queensland with notes on their distribution and control.

Price to Queensland farmers	5s.
To others	7s. 6d.

Available from Department of Agriculture and Stock, Brisbane.

pasture and crop

Lucerne Outstanding Pasture Legume.—Pastures of green panic, Rhodes and buffel grasses, all in combination with lucerne, have again shown their outstanding usefulness in Queensland's medium rainfall dairying districts.

In the Kingaroy, Monto, Biloela, Rockhampton and Darling Downs districts, these mixtures have proved their ability to carry at least twice as many stock as native pastures.

Trials last year showed that lucerne was still the most versatile pasture legume in Queensland. Although some of the tropical legumes were showing great promise in coastal districts, lucerne's climatic range was still greater.

On a black clay loam at Monto, green panic and lucerne and Gayndah buffel and lucerne have persisted well for two years. Elsewhere in this district, lucerne has been oversown into a long-established Rhodes grass paddock. Here the lucerne is competing successfully with the Rhodes grass. Similar observations have been made on trials at Etna Creek and Kalapa, near Rockhampton.

At Baking Board, near Chinchilla, on a red-brown sandy loam, seven years' persistence of green panic and lucerne and Rhodes grass and lucerne is outstanding. A contour row pasture of two rows of green panic alternating with one row of lucerne is performing well. With rows 42 in. apart, the pasture is producing from 60 to 100 per cent. more feed than similar pastures with row spacings of 7 to 14 in.

Combinations of Rhodes grass, lucerne, green panic and barrel medic in the Millmerran district are carrying one cow to three or four acres. In good seasons, these pastures carry a cow to two acres.

In 1959, 103 pasture trials were carried out under the direction of the committee. In addition to observations on the performance of different pasture species, trials were put down to study rotational grazing, the value of fertilizer and irrigated pasture.

Irrigated pasture trials at Kilkivan, Miva (Gympie district) and Byee (Kingaroy district) have demonstrated the suitability of these districts for pasture irrigation. Fourteen irrigated pasture trials were in progress during the year.

Seven nitrogen topdressing trials were in progress during the year on paspalum, mat grass and blue couch pastures. Once again it has been shown that nitrogenous fertilizers will give big increases in yields of summer forage.

At Cooran the forage yield was doubled during the warm summer months by applying 2 cwt. of sulphate of ammonia at a paddock cost of £4 an acre. The yield was almost 11 tons of green material an acre. In a season with ample moisture, the cost of producing additional grass forage is less than 13s. a ton.

A detailed grazing trial at the Rocklea Animal Husbandry Research Farm compared the effect of rotational grazing on animal growth and pasture productivity. Rotational grazing gave a pasture yield of 15·9 tons of green material an acre and constant grazing 13·6 tons of green material an acre. Over a two-year period, rotational grazing gave an increase of 25 lb. an acre in liveweight gain over constant grazing.

—W. J. S. SLOAN,
Director of the Division of Plant Industry.

Safflower—A New Grazing Crop.—The oilseed crop safflower is likely to be added to the limited range of winter grazing crops in Queensland. Tested as a grazing crop at the Biloela Regional Experiment Station for the last two years, safflower has shown distinct promise.

This does not mean that safflower will replace oats and wheat as the State's main winter grazing crops. The preliminary trials at Biloela have shown merely that safflower is a valuable grazing crop in winter and spring, when shortage of fodder is always a problem.

In Queensland, safflower has been grown for seed for many years. The different varieties have been widely tested at the Agriculture Department's experiment stations, and seed of the Horowitz variety was increased for commercial plantings.

Grazing trials over two seasons indicate that safflower may be an even better fodder crop than oats. Safflower and oats are similar in actual feed value, but safflower stands up to both dry conditions and heavy grazing better than oats.

Crops of safflower have been shown to provide grazing for eight weeks compared with three to four weeks' grazing from oats. In addition, safflower regrowth continued for four weeks after oats, planted the same day, had died.

The Biloela trials showed that cattle did not immediately take to safflower when first introduced to the crop. But in a few days they acquired a taste for it and then accepted it readily.

—W. A. R. COWDREY,
Senior Experimentalist.

Check Your Flail Forager.—The increasing popularity of the flail forager can be attributed to its simplicity of design and its rugged construction. These attributes, however, can lead to a disregard of routine maintenance which in turn can lead to unnecessary expense and possibly a serious accident.

You can't replace fingers! So be sure to disconnect the P.T.O. drive and switch off the tractor engine before attempting to carry out maintenance work.

Due to the high peripheral speed of the rotor it is most important to maintain rotor balance by checking all the flails or swinging hammers at every inspection. A missing or damaged flail can set up excessive vibration causing blockages, worn-out bearings and possibly a serious accident.

Where a shredder bar is fitted check the clearance of the flails with each swinging flail extended.

The three main parts to watch are the rotor or cutter drum, the countershaft and the V-belt drive.

Take care when greasing the sealed and self-aligning bearings on the two shafts. Over-greasing will damage the seals.

Check the tension of the V-belts which should have ½-in. play between the pulleys on the top side. When making belt adjustments, keep the pulleys in line because mis-aligned pulleys cause worn sheaves and broken belts.

And remember, when replacing belts always replace the complete set and not merely the faulty one.

—C. G. WRAGGE,
Agricultural Engineer.

Wildlife on Tinaroo Dam.—Wildlife conservation is assisted by water saving projects such as the Tinaroo Dam on the Atherton Tableland. This dam is a sanctuary and the impounded waters and adjacent lands are providing food, water and shelter for much wildlife including many of our native ducks.

Wildlife, particularly game species, are building up on the Tinaroo Dam. In order that an adequate number of these game birds will overflow into shooting areas it is important that they remain undisturbed. For this reason, shooting on the dam is not permitted and the co-operation of all local sportsmen is urged so that their interests will be preserved for future years.

C. ROFF, Fauna Officer.

Dairy Planning Now

Prepare suitable calf paddocks for rearing young stock.

Commence training heifers to ensure good milk "let-down".

Tattoo calves for future identification.

Re-tin and repair cans during the winter months.

Ensure that cows have 4–8 weeks' dry period before calving.

Dehorn cattle.

Silage On The Southern Downs

By A. G. MARTIN, Agriculture Branch.

The Southern Darling Downs is only one area in the whole of Queensland where silage making is being practised by farmers. Those farmers who have not yet made the decision to conserve fodder in the form of silage should, from this article, obtain some further evidence of silage's advantages and some additional knowledge on the steps involved in its production.

Each year an increasing number of Southern Darling Downs farmers are including silage making in their fodder conservation programme. Successes with drought feeding of silage which have been achieved by some district cattlemen are to a large extent contributing to this rapid expansion in silage making.

Forage harvesters have taken most of the hard work out of silage making and so these machines are becoming a common sight on district farms.

During the coming season it is anticipated that many more thousands of tons of valuable silage will be conserved by district farmers. Some of these farmers will be conserving silage for the first time.

What are the Best Crops?

A wide range of summer crops can be used for silage. Because of the summer incidence of rain in this district there is a much better chance of having a surplus of crop for silage during the summer than during the winter.

Wheat, oats, barley, field peas, and vetches are all suitable for silage but very few such winter crops have been ensiled in the past mainly because much greater yields can be obtained from most summer crops.

The popularity of the different crops in this district can be easily gauged by examining the amounts of silage conserved in 1959 by 24 farmers:

Crop	Quantity Ensiled	Percentage of Total	Number of Farmers
	Tons		
Sweet Sorghum ..	800	38·3%	8
Sudan Grass ..	500	23·9%	5
Lucerne	450	21·5%	3
Grasses and Clovers	230	10·6%	3
Cowpeas	60	2·9%	3
Grain Sorghum ..	40	1·9%	1
Maize	10	0·5%	1
Total	2,090	..	24

Cowpeas grow exceptionally well on most types of soil in this district and are often grown either mixed with another crop or on their own for mixing with low protein crops. Because of the different times of maturity it is preferable to plant the cowpeas in separate strips and mix the crops when filling the silos. The cowpeas can then be planted at a different time from the other crop, if necessary, so that the two crops reach the correct cutting stage together.

Lucerne is grown on a large number of farms and is usually available for cutting and mixing with high sugar, low protein crops.

SUMMER CROPS FOR SILAGE—SOUTHERN DARLING DOWNS

Crop	Time to Plant	Seed Rate/Acre (Drilled)	Row Spacing	Varieties	Type of Crop	Stage to Harvest	Average Yield/Acre	Quality Silage
Maize	November, early December	8–10 lb.	Just wide enough to cultivate	Q790, Q724, DS303	High sugar — low protein	Early dented stage	15–18 tons	Low in protein
Sweet Sorghum ..	November, early December	6–8 lb.	14 in.	Sugardrip Sumac Italian Saccaline	High sugar — low protein	Firm dough ..	15 tons	Low in protein
Sudan Grass ..	November, December	8–10 lb.	7 in.	Sweet	High sugar — low protein	Seed just forming ..	8–10 tons	Low in protein
Millet	November, December January	10–14 lb.	7 in.	White Panicum (Siberian) Japanese	High sugar — low protein	Before seed matures	6–8 tons	Low in protein
Cowpeas	November, December	8–10 lb.	7 in.–14 in.	Malabar, Poona Cristaudo	High sugar — low protein	When first pods form	8–10 tons	High in protein
Lucerne	April, May	6–8 lb.	7 in	Hunter River	High sugar — low protein	Early bloom stage ..	5–6 tons	High in protein
Irrigated Pastures	April, May	1 lb. Ladino Clover or 1 lb. Irrigation White broadcast Clover 1½ lb. Phalaris arundinacea 1½ lb. Phalaris tuberosa 3 lb. Cocksfoot or 2 lb. Perennial Prairie 1 lb. H. 1 Rye Grass	7 in.	..	High sugar — low protein	When grasses flower—before pollen shed	8–10 tons	High in protein

Both cowpea and lucerne are low in sugar, and if being ensiled on their own, will require an additive such as molasses or crushed grain. The crop should be wilted to reduce the moisture content to below 70 per cent., if molasses is to be added. The moisture content of these high protein crops at the time of ensiling is important and should not exceed 70 per cent., otherwise low quality silage will result.

It is advisable to sow summer crops for silage during November and early December so that they are not ready to harvest until after the usual heavy summer rains have finished.

The most popular summer crops used for silage are obviously sweet sorghum and sudan grass. Yields of sweet sorghum as high as 15 tons to the acre are quite common on the Southern Darling Downs from areas where the rainfall is considered unreliable. Sweet sorghum is a high sugar crop and although it is very easy to make good silage out of such a crop, the result is only a medium protein silage that has to be supplemented with protein concentrates to provide a production ration.

Sudan grass is similar in these respects, the main difference being that sudan grass does not yield so heavily per cut, 10 tons to the acre being a good average yield. This crop does come away well after cutting, however, to produce either good grazing or a second lighter cut for silage. This crop is handled very easily by flail type forage harvesters and for this reason is very popular.

Maize is the heaviest yielding summer crop but can only be grown on the areas where rainfall is fairly reliable. Good crops could be grown for silage along the Eastern Darling Downs from Killarney to Headington Hill and at such centres as Nobby, Clifton and Freestone. Yields of 15 to 18 tons of green material to the acre could be harvested from maize crops during a normal season.

Millet crops have not been used to any extent for silage because of their low yields compared with maize and sweet sorghum. The grazing millets such as white panicum (Siberian) and Japanese millet are quite suitable for silage and can be used for this purpose during flush seasons.

All of these crops are relatively easy to harvest, and because of their high sugar content, there are no problems associated with ensiling them. Because of their low protein content it is preferable to mix them, load for load, with a high-protein, low sugar crop such as cowpeas, lucerne or irrigated pasture during the filling of the silo.

To determine when the crop has wilted sufficiently an average sample of cut material should be examined. When at the correct stage the stem and leaves will be limp and the material cool and moist. The stems should be easily broken by twisting, and the broken ends should appear moist and dark in colour. A handful of chopped crop should not exude free sap when squeezed in the hand.

It is emphasised, however, that the crop must not be wilted too much. A moisture content between 65 and 70 per cent. should be the aim. This material can then be ensiled if 2 to 3 gal. of molasses mixed with equal parts of water is added to each ton of green material.

Alternatively lucerne or cowpeas may be ensiled without wilting providing a dry preservative such as crushed grain is added when filling the silo; 150 lb. of crushed grain of 12 per cent. moisture will reduce the moisture content of one ton of chopped green crop from 75 to approximately 70 per cent. The grain performs a dual purpose, reducing the moisture to a safer limit and, by adding fermentable starch, assisting in the rapid formation of the acids needed to make the material into silage.

Irrigated pastures have been ensiled on the Southern Darling Downs, too. Surplus growth during flush seasons can be converted into a high protein silage using those methods recommended for lucerne and cowpeas. Good quality pasture silage will provide more than a maintenance ration for cattle. Cattle will produce or fatten on such silage. Yields of 8-10 tons to the acre are quite common with irrigated pasture.

Types of Silo Used

Trench and combination trench-clamp-stack silos have been used almost exclusively up to the present time. There is, however, a small percentage of silage stored in tower silos. The popularity of the trench silo in this district is due to the low cost of construction (£15 to £25 per 50 ton capacity), the short period required for construction and the suitability of this type of silo for long-term storage of drought reserves.

Plate 1: **Two Trench Silos on Mr. S. Smith's Property, Nobby, Filled with Sweet Sorghum.** Straw has been spread over the silo on the right in preparation for covering with a weather-proof layer of soil. Mr. Smith filled four 75-ton trench silos this year.

The practice of using a number of small trench silos, 50 to 60 tons capacity, is recommended in preference to using one larger trench of 100 to 200 tons capacity. Small trenches can be filled quickly and when feeding out it is usually possible to empty the silo completely during a dry winter period or a short summer drought. The remaining silage is still well protected in other trenches and the empty trench is available for refilling when crops become available. With large trenches there is the possibility that they will be only partly emptied when the summer rains come and this can cause wastage and other problems with trenches constructed on flat land.

On the Southern Darling Downs hardly a year goes by when silage could not be made during the summer and fed out to dairy cattle during the dry winter period. For this reason many district farmers are becoming interested in above-ground silos suitable for short-term storage. Circular weldmesh and clamp silos are creating considerable interest.

During the coming season both types of above-ground silos will be used in the district. Demonstrations will be conducted so that interested farmers can see these silos in use. These silos vary in price depending on the materials used. A 50-ton weldmesh silo would cost approximately £25 whereas timber and bolts for a 50-ton clamp silo may cost as much as £50.

By using second-grade hardwood timber, though, such a silo can be built fairly cheaply. Clamp silos can be either a fixture or portable. Portable clamp silos are built in movable sections and can be used on different sites handy to the crop being ensiled. The main advantage of above-ground silos is that the silage can be self-fed to stock more conveniently from them than from other types of silos.

Harvesting

Forage harvesters are used on nine out of every 10 farms to harvest the crop. The number of forage harvesters in the district has more than

Plate 2

Mr. Wissemann Harvesting a Crop of Sugardrip Sweet Sorghum for Silage, Using a Combination Flail Type Forage Harvester and Self-Emptying Trailer. Mr. E. Wissemann's property is Headington Hill, near Clifton. Crops average yield 15 tons to the acre.

Plate 3

Mr. A. Crane, Elbow Valley, near Warwick, Unloading Chopped Lucerne and Grass from a Combination Forage Harvester-Trailer Unit into a 200-ton Trench-Clamp Silo.

doubled in the last year and contractors can now be hired without any difficulty.

Flail type forage harvesters are used almost exclusively mainly because of their lower cost and their ability to handle a wide range of silage crops without additional attachments. Flail machines are used to harvest everything from grass to maize, and, although they have their faults, they have proved very popular. The important points to observe when using flail machines are to have the machine properly adjusted to cut the material into as short a section as possible, and to avoid setting the machine too low in an attempt to get all of the plant stalk. It is best to leave some stalk in order to avoid getting excessive quantities of dirt mixed in with the forage.

The machines do not produce as good a sample of chopped material as is obtained with other types of forage harvesters, where the length of cut can be adjusted down to as short as ¼ in. The shorter cut is a distinct advantage when feeding out silage.

The types of forage harvester units vary from combination harvester, self-emptying trailer units to machines requiring separate trailers or trucks. With the latter type of forage harvesters, a self-emptying trailer is ideal to complete the unit. Such a unit can be used to harvest the crop, the trailer can then be unhitched when filled and taken and emptied into the trench without any manual labour being used. Some farmers use their farm tip truck with a wire mesh and hessian enclosed tubular steel frame for carting in the harvested crop material. This practice is only used as an emergency measure until suitable trailers can be obtained. The slow speed at which the truck must be driven, the blocking up of radiators with light crop material and the need for an extra man to drive the truck make this method much less satisfactory than others where a trailer is used.

Filling and Covering Silos

(*a*) *Trench and Clamp Silos*

Trench and clamp silos are by far the easiest to fill. The material is simply emptied into the silo by running the trailer either through it or by backing it up to the side. The material can then be spread by handforks or by tractor-mounted implements such as light dozers, buckrakes, and so on. The first layer should be at least 3 ft. deep. When the material reaches a temperature of 90 deg. F. it can then be consolidated by rolling with a tractor.

Good silage can be made if the temperature is maintained at approximately 100 deg. F. Material rolled when it reaches 90 deg. will normally continue to heat until it reaches 100 deg. To control the temperature the amount of air in the green material must be regulated. If the material is not heating sufficiently, rolling should be delayed. If it is overheating then rolling should be carried out immediately.

After the first layer has been rolled, filling can be continued in stages, checking the temperature, and rolling as required.

Plate 4

Rolling Sweet Sorghum in a Trench Silo on Mr. E. Wissemann's Property at Headington Hill. The material was harvested with a flail type forage harvester. The trench held 75 tons of silage filled to 2 ft. above ground level. The silo was purposely constructed leaving one side clear of spoil to enable the forage harvester-trailer unit to be backed in at the side for emptying.

A very good system adopted by local farmers is to fill two small 50 to 75 ton trenches at the same time. Where suitable equipment is in use this practice enables large quantities of material to be conserved in a short time; the ensiling of 150 tons in less than a week is possible. While the first layer in the first trench is heating, filling of the second trench can be started, and little time will be wasted.

If ensiling lucerne, cowpeas or pasture on their own, the molasses and water, or crushed grain, should be applied to each load as it is spread.

Trench silos should be filled well above ground level so that when they are packed down and covered they possess a domed surface which will shed rain. Filled trenches should be covered with a layer of soft straw followed by a layer of soil at least 12 in. deep. The material should have been thoroughly rolled before filling and the covering soil should be rolled daily for a week to aid thorough compaction of the top layer of silage and to consolidate the soil covering. The covering soil may be planted to some annual crop or left bare. It should be inspected occasionally and any cracks which appear should be filled in to prevent water from reaching the silage.

(*b*) *Weldmesh Silos*

Weldmesh silos are filled using either an elevator or blower. The material is spread and trampled, with attention being paid to the temperature. These silos should be constructed to give at least 6 ft. depth of settled material. The filled silo should be covered with some light material such as soft straw, with a good layer of sawdust on top, or alternatively a heavy material such as soil may be used instead of sawdust.

This serves the same purpose, as in other silos, of keeping out air and water.

If silage is to be held for only a few months before feeding, a lining of a light grade of tar paper will be sufficient to restrict wastage on the sides.

Trials at present in process near Brisbane suggest that thin sheets of tempered pressed board may give long and economical service as lining material in arc mesh silos.

The first cost may be higher, but the ultimate annual cost is less than with more flimsy lining material.

It is well known that many other districts in Queensland are becoming alert to the value of silage. Further, it is most gratifying that mechanisation is able to encourage this valuable aid to prosperity and security.

Much more fodder conservation still is necessary in our livestock areas.

stock and station

Faster Beef Gains with Lucerne.—Grazing lucerne is showing promise as a cheap and practical supplement to native pasture in trials at the Brian Pastures Research Station. Cattle allowed winter and spring grazing on a small patch of lucerne in addition to native pasture gained up to 140 lb. more in a year than cattle on native pasture alone.

This was a feature of the first two years' results from a native pastures management trial.

In the trial, cattle running on 25 acres of native pasture were allowed grazing on 5 acres of lucerne during the winter and spring. During the remainder of the year, the lucerne was conserved as hay.

Two-year-old steers receiving lucerne in 1958 gained 71 lb. liveweight a head more than similar stock grazing on native pasture alone. In 1959, the lucerne-fed group gained 147 lb. a head more than those on pasture only. The cattle fed the supplement were ready for slaughter in the spring, a time when beef prices are usually high.

There is, however, a risk of bloat from uncontrolled grazing on lucerne. Prevention of bloat under these conditions requires further study.

Another early result from the native pastures study is the sensitivity of the composition of native pastures to different management methods. Black speargrass is becoming less prevalent on pastures grazed rotationally and on pastures that are spelled occasionally and treated with a rotary chain slasher. However, these treatments have not yet improved cattle growth.

Renovation with a chisel plough increased the density of native legumes in 1958, but not in 1959. In 1958, cattle on pastures treated with the chisel plough gained 54 lb. more than cattle on untreated pastures. The margin in favour of the treated pastures was 15 lb. in 1959.

—W. J. S. SLOAN,
Director, Division of Plant Industry.

Veterinary Milage Scheme Success.—The Murgon dairyfarmers' subsidised scheme to defray milage charges for veterinary aid has been a success. After a year's trial, it has been found that the assessment rate can be reduced. Milage charges for veterinary services by a private practitioner will now cost producers an average of little more than £1 a year.

Late in 1958, suppliers to the Murgon co-operative butter factory and their cheese factory at Goomeri considered the problem of veterinary milage charges. They felt that some method should be found to equalise the milage charges involved in having their stock treated by the local private veterinary practitioner.

After consultations between representatives of the Queensland Dairymen's Organisation, the Murgon butter factory and the Department of Agriculture and Stock, a scheme was worked out. It applied to suppliers in the whole area and commenced on December 1, 1958.

Under the scheme, milage charges made by the approved veterinary surgeon for the treatment of stock belonging to contributors are paid from a central fund. The scheme is financed by a special assessment on dairy produce and a Government subsidy of 10s. in the pound. Producers paid an assessment of one-twentieth of a penny on each gallon of milk and one-tenth of a penny on each pound of butter.

Collections and payments from the fund will undoubtedly fluctuate from year to year. However, careful consideration of the financial position after the first year's operations has shown that the farmers' contributions can be reduced.

Under the scheme, producers will now have all milage charges for veterinary services to farm animals paid for an average cost of little more than £1 a year. It is hoped that the success of this scheme will stimulate the adoption of similar schemes by farmers' organisations in other areas.

New Drugs Aid Chicken Rearing.—New drugs for preventing coccidiosis in chickens could change the method of rearing broilers and grillers in Queensland.

With the aid of nicarbazin and zoalene, these chickens can now be reared on the ground as successfully as they can on wire floors. Ground rearing reduces the cost of housing the birds.

The drugs that prevent coccidiosis are supplied continuously, in the mash, until the birds are ready for slaughter. The drugs act by hindering the development of the coccidia in the intestines of the chickens so that coccidiosis does not occur.

Nicarbazin was the first really effective drug to combat coccidiosis, and has been used by poultry farmers here for about two years. More recently, zoalene has appeared on the market. Nicarbazin is a preventive only, but zoalene can be used either as a preventive or as a treatment once outbreaks occur.

In broiler chickens, prevention of coccidiosis outbreaks is preferred to treatment. Even though drugs used for treatment may reduce the number of deaths and check an outbreak, the birds still suffer a setback. A setback will reduce the small margin of profit.

Table cockerels have been reared largely on wire floors in south-eastern Queensland. This method of management has been adopted mainly to avoid coccidia and other internal parasites. On the central and far north coasts, ground rearing has been practised, but coccidiosis has always been a hazard. With the use of nicarbazin, however, several large broiler producers claim complete success. Not only is coccidiosis prevented, but the broilers dress out much more evenly at slaughter.

The effectiveness of the new drugs has already started a trend back to rearing table chickens on the ground. With the market expanding, a further shift in the management method can be expected. Roundworm infestation will be a danger in broilers reared on the ground, but effective drugs are available to combat this parasite.

—*P. D. RANBY,*
Veterinary Officer.

Baby Pig Losses.—Within half an hour of birth, the body temperature of normal piglets drops several degrees, and under favourable conditions takes about 48 hours to rise to the normal average of 102·5 deg. F. If the newly born pigs strike unfavourable conditions the return to normal body temperature is delayed. When exposure to cold and damp occurs or the pig lacks food, the temperature may continue to fall. This is the reason behind many of the losses before a litter is three days old.

You can avoid most of these very early losses by feeding the sow well from mating to farrowing and by keeping litters warm and dry for the first few weeks.

Warmth and comfort you can provide by building snug dry farrowing pens, fitted with a creep, and a hoverboard to conserve heat.

But how does feeding of the sow weeks before farrowing affect pigs after birth?, you ask. It's really quite simple. Thin light pigs lose heat faster than big fat pigs at birth. Strong heavy pigs can withstand cold better. Thin weak pigs are more often injured by the sow, and also frequently die of starvation.

Feeding the sow properly during pregnancy helps to secure a litter of heavy, vigorous pigs at farrowing. If there are no weak light pigs, you have therefore eliminated your likely losses.

—*T. ABELL,*
Senior Adviser, Pig Branch.

* * *

Growing Cowpeas for Seed

By G. VERHOEVEN,
Experimentalist.

Growing cowpeas for seed promises to become a profitable industry in the Lower Burdekin area. Results of work done at the Department's Ayr Regional Experiment Station are described:

The practice of using cowpeas as a nitrogen-rich green manure or as a high-protein fodder crop is quite common on many Queensland farms. The recent introduction of stem-rot-resistant varieties is expected to stimulate this practice and in order to supply the demand, considerable quantities of seed will be required annually.

Commercial seed production of cowpeas, already a useful source of income for many farmers on the Atherton Tableland and in the Kingaroy and Darling Downs districts, is concerned mainly with the popular varieties Poona and Reeves which can be harvested readily by machines. These varieties are, however, highly susceptible to stem rot and therefore unsuited to humid areas.

Plate 1

A Crop of Santiago Cowpea at Ayr Regional Experiment Station, Four Weeks before Harvesting.

New varieties resistant to this disease are more difficult to harvest mechanically on account of their prolific, prostrate vine growth and indeterminate fruit setting. Up to the present, techniques used for seed collection from these varieties are either not mechanised or only partly so, and this requires a considerable amount of expensive labour.

Trials have been carried out at the Ayr Regional Experiment Station in the Lower Burdekin Valley, to investigate the possibilities of mechanical harvesting, and results to date have been sufficiently encouraging to suggest that this crop could become a commercial proposition for farmers in the Burdekin district.

Summer-Growing Annual

The cowpea is a vigorous, deep-rooting, summer-growing annual of tropical origin which does well on a wide variety of soils. It does best under warm, moist conditions but once established has a marked capacity to survive dry spells.

In the Burdekin the varieties discussed have a 4 to 5 week flowering period, which commences 3 to 4½ months after planting so that the crop matures in 4 to 5½ months. Pods are set throughout the entire flowering period. On this account seeds do not ripen uniformly, but loss of seed due to natural shattering does not readily occur.

The combination of a hot and humid period during late December-April, followed by a dry winter and early spring with associated low humidity and an ample supply of good quality irrigation water, as experienced in the Burdekin, has been found to be very favourable for the growing of cowpeas for seed production.

Because it is a leguminous crop it requires the presence of certain bacteria in the soil for maximum development. Areas in which cowpeas have not been grown previously may be deficient in the specific strain of bacteria. In such cases, the planting seed is best treated with inoculum. This can be obtained free of charge from the Department of Agriculture and Stock, Brisbane, or the Bureau of Tropical Agriculture, South Johnstone, stating the amount of seed to be treated. Cultures will retain their viability for several weeks if stored according to the instructions included.

Disease Resistance

There are many different varieties of cowpeas, but on account of stem rot (*Phytophthora vignae* Purss), a disease which has threatened to eliminate the cowpea as an agricultural crop in the humid zones, the degree of resistance shown by a variety is of utmost importance.

Poona and Reeves are both highly susceptible and therefore entirely unsuited to areas where the disease occurs. Other varieties such as Malabar and Giant possess good field resistance but may be affected to varying degrees where conditions are particularly favourable for disease development. The varieties Blackeye 5, Havana and Santiago on the other hand have proven their resistance under all conditions.

It is obvious, therefore, that for an industry which has to find its markets in the wet tropics, the only suitable varieties at present available are Blackeye 5, Havana, Santiago and Malabar.

Investigations at Ayr were confined to the Malabar and Santiago varieties only, but the characteristics of Blackeye 5 and Havana are nearly similar.

Establishment of the Crop

Cowpeas may be planted in the Burdekin district at all times of the year. The late December-March period, however, offers the best prospects on account of low production costs.

Later plantings require an increasing number of irrigations, while during the colder winter months of June and July restrictions in growth make young crops highly susceptible to bean fly and aphis attack, pests which at other times do not affect this crop. Frequent costly sprayings with DDT and/or nicotine sulphate are then required to keep the plants moving.

The wet season rainfall generally commences in this district during the second or third week of January but storm rains are likely from late November onwards. These rains, combined if necessary with a pre-planting irrigation, may be utilised to establish the cowpeas before the onset of the wet season rains. However, during the wet season, plantings may be carried out whenever dry spells of sufficient duration are experienced to allow the ground to be worked.

Seedbed Conditions.—Under the tropical conditions experienced in the Burdekin during the summer, extensive seedbed preparation is not essential for good growth, apart from that which is required to obtain a reasonably fine tilth free from weeds. Furthermore, cowpeas are largely self-supporting regarding nitrogen supplies and little or no time need therefore be allowed for the decomposition of the grass and stubble worked under during the seedbed preparation.

The main characteristics of the early and later plantings are summarised:

December–January Plantings.—These plantings have the advantage of a lower cost of production as they require little or no attention after establishment until harvesting time.

Plate 2

Santiago Cowpeas Ready for Harvesting.

Following harvesting of the seed in May or June, irrigable land may be planted to a second cash crop like sorghum or maize as this crop then benefits considerably from the preceding legume crop. Volunteer cowpea seedlings do not cause great difficulty during the colder months, as growth is then extremely slow, giving the cash crop sufficient time to get away.

The tendency of cowpeas to produce excessive vegetative growth and a more indeterminate fruiting habit under conditions of high summer rainfall is a disadvantage. However, investigations are in progress in which the crop is sprayed with light concentrations of phenoxy compounds for better fruiting.

Dry weather conditions are imperative for successful harvesting. Such conditions are found in the Burdekin district from late May onwards and plantings should therefore not be established earlier than late December. In general, the later the planting the greater the chance of securing dry harvesting conditions.

February–March Plantings.—The cost of production in these plantings is generally higher because of the additional irrigations and possible inter-row cultivations needed. Less vegetative growth is made, however, with a more determinate setting of fruit due to the influence of the cooler weather and the shorter days. Yields from 12 to 20 bus. an acre have been obtained.

At present it would appear that any planting during the December–March period should be suitable for seed production purposes, but that plantings from February onwards are to be recommended until further investigations have clarified the possibilities of fruit induction in the earlier plantings. These undoubtedly have higher seed potentialities.

Planting Techniques

Row Spacings and Seeding Rates.—Sowing is best done with a seed drill or combine but satisfactory results may be obtained by broadcasting the seed and following this up with a light discing and harrowing. For row spacings of 21 in. and more, two or four row planters may be used.

For harvesting methods, which up to the present have involved handpicking of the pods or cutting the vines at ground level and threshing with a stationary harvester or modified cornsheller, wide row spacings are practised. These row spacings vary between 30 in. and 42 in. at a seeding rate of 6–10 lb. an acre. Further experience has indicated that mechanical harvesting requires close row and plant spacing, to prevent undesirable pod setting on runners close to or on the ground in the inter-row space. These are impossible to harvest. Best results were obtained where a densely interwoven mat was obtained with the seed pods at an even height above the bulk of the vegetative matter. Successful mechanical harvesting is based on a spacing of 7 in. or 14 in. requiring 20–25 lb. of seed an acre when drilled or 25–30 lb. when broadcasted.

Plate 3

Mower Knife Penetrating the Crop.

Such high seeding rates at the same time provide a quick soil cover which is essential under wet tropical conditions when summer grasses can be so prolific.

Irrigation

Under favourable conditions, late February–early March plantings can mature without the need of additional irrigation but usually one or two irrigations are required for best results. Crops grown with the aid of spray or border check irrigation may still use the closer spacings, but where furrow irrigation is practised rows should be spaced at a minimum of 21 in. A seeding rate of 10–15 lb. per acre is then recommended. For best harvesting results it is advisable to keep the furrows small and maintain the ground as even as possible when inter-row cultivations are carried out.

For late-sown crops intended to be grown without irrigation, a minimum of 21 in. is advisable, to obtain better water utilisation and allow early weed control in the inter-row spaces.

Harvesting

Because of the fleshy nature of the stalk and leaves, the prolific vine growth, rather prostrate habit and the indeterminate fruit setting and ripening of the pods, these new varieties do not lend themselves readily to mechanical harvesting. Moreover, direct harvesting when the majority of the pods were dry and threshable but with the vines still in a green condition resulted in an unsaleable seed sample, heavily contaminated with trash.

Results after the crop was allowed to dry out completely in the field by withholding the irrigation water were equally unsuccessful due to excessive seed cracking. This was apparently due to the fact that during the long drying period the earlier pods dried out too much.

The procedure was therefore varied so that the plant would be either wholly or partially killed, to allow a quick drying of the succulent vines and the maturation of the fully developed green pods, before the actual threshing for seed was carried out.

A 5 ft. rear-mounted agricultural mower was used when approximately 75 per cent. of the pods were dry. An overlap of approximately 8 in. must be taken during the mowing as in this way the rear wheels of the tractor hold down the strip of cowpeas which has been previously mown. A protective cover under the driveshaft of the mower is needed to prevent the vines from wrapping around it. Both swathboard and shoe should be removed and only the bare cutterbar used. Plates 3 and 4 illustrate the method.

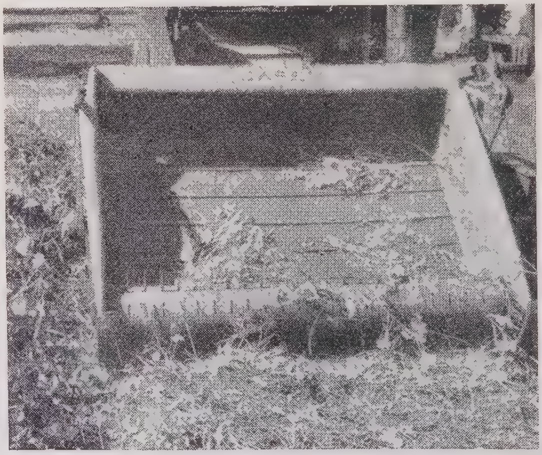


Plate 4

Gathering the Crop for Threshing.

With the cutting width reduced to approximately 4 ft. because of the overlapping, the mower can cover 1 acre in 2 hours' mowing time. So as to minimise loss of seed due to the cracking of dry pods when driving the tractor over the vines, mowing during the early morning is recommended.

By leaving the vines undisturbed for 4 to 7 days, the green pods and vines dry out to the necessary brittleness and make efficient threshing possible.

Where the wider row spacings are practised the furrows required for irrigation as well as inter-row cultivation tend to make the ground uneven. The mower then has a tendency to cut up the plants into smaller portions which cannot be readily collected by the header. On very uneven ground the use of a cane ratoon disc cutter may be more successful as plants are cut below ground level and left intact.

In the closer spacings, where the vegetative matter usually forms a compact mat, an all-crop harvester has been found to be efficient. The use of the pick-up attachment should not be necessary as the dry mown strips can be picked up more easily by lowering the cutter bar as close to the ground as possible. In this operation the reel beaters must always be positioned in a forward position and close to the knives to assist in forcing the material up the canvas conveyor belt.

A more efficient method which, although higher in cost, may be more suitable for large-scale operations is offered by the use of chemicals. Various chemicals called desiccants have the ability to quickly kill off the aerial parts of plants without affecting the viability of the seeds. So far, best results with cowpeas have been obtained with PCP (sodium pentachlorphenate or pentachlorphenol), applied at the rate of 10 lb. active ingredient to the acre, together with 2 gal. of mineral oil in 50 gal. of water. When applied under dry, warm conditions, a maturing crop of Santiago cowpeas withered in less than 3 days, bringing mature green pods into a threshable state.

With closely grown crops where even pod-setting prevails it is often sufficient to have only the top leaves and stalks in a brittle state. This makes it possible to take the seed crop off with the cutter bar above the main body of vegetative material. Costs might be reduced under such conditions.

Type of Harvester

Some makes of all-crop harvesters have been found to be better than others for the harvesting of this particular crop. In nearly all cases slight modifications in the form of rubber beaters, smooth concaves and special sieves are also required. However, most of the later models give satisfactory results if the recommendations of the makers are carefully followed.

The peg-type threshing cylinder is better adapted to crops, the seeds of which are hard to separate from the seed cover. Best results have been obtained, however, with the rub-bar type drum, operated at the lowest possible speed and using a smooth concave.

The severity of the threshing and consequently the cracking percentage is largely governed by the peripheral speed of the drum. For a 20 in. drum the speed should be between 200 and 300 r.p.m. With such a low speed and a wide concave clearance no difficulty should be encountered in keeping the cracking percentage under the 5·25 per cent. which is the maximum allowed by Departmental standards. By using the correct sieves and finishing screens, little or no after-cleaning should be required.

Seed Storage

Cowpea seed is very susceptible to attack by pests like bean weevils and mites and should be treated immediately after harvesting with BHC dust. Thorough cleaning of the harvester after use is strongly recommended as this machine can be a source of contamination.

Cost of Production

Stocks of seed of stem-rot-resistant varieties are very small at the time of writing so that no sales price can be quoted.

On account of the more difficult and costlier harvesting methods involved compared with Reeves and Poona, it is expected that a price of £3 a bus. f.o.r. Ayr could be commanded until such times that harvesting techniques have improved and better yields can be obtained. Based on this price and a yield of 15 bus. to the acre of cleaned seed, the following table gives an indication of the costs involved, and probable average returns an acre.

The figures have been based on farming as a family unit, with or without a permanent hand—as at present obtains in the sugar farms of the Burdekin Delta. Machinery depreciation has been included.

	£	s.	d.	£	s.	d.
Land Preparation (per acre)—						
One ploughing	1	0	0			
Two discings		15	0			
One harrowing		5	0			
				2	0	0
Planting—						
Planting (7 in. to 14 in.)		4	0			
Seed 20 lb.	1	0	0			
				1	4	0
Growing—						
Irrigations (3 in.)					15	0
Harvesting—						
Mowing	1	10	0			
Harvesting	5	0	0			
Bags and twine		15	0			
Cartage to rail	1	0	0			
Extra labour	2	0	0			
				10	5	0
Total Costs				£14	4	0

	£	s.	d.
Returns—15 bus. at £3	45	0	0
Less—Production costs	14	4	0
Profit (per acre)	£30	16	0

Desiccants Technique

If desiccants are used, the cost would be approximately £3 10s. an acre higher than if mowing were done. However, this would be partly compensated for by less seed loss, and more efficient handling.

Good Demand for Seed

The demand for seed of stem-rot-resistant varieties of cowpeas is quite good. This is instanced by the fact that in the sugar-growing areas north of Maryborough it has been estimated that about 7,000 bus. of cowpea seed together with 12,000 bus. of velvet bean seed were sold in 1958. This would be sufficient seed to plant more than 50,000 acres and most of it would have been planted by sugar growers for green manuring purposes.

Several districts in Queensland seem to be suitable for the production of cowpea seed, but growing and harvesting conditions in the Burdekin district are ideal. Moreover, there is a considerable acreage of suitable land that could be used to supply the growing need for seed. Other legumes might also be considered for seed production in this area.

Production of legume seed is not an enterprise which may be taken up by all farmers, but those who feel interested in a branch of agriculture which offers ample scope for initiative and resourcefulness may be confident that the returns will compare more than favourably with those from most other crops.

Vitamin A For Pigs

Many pig raisers find that most of their setbacks occur in the spring months, when weather conditions are mild. When the causes of these setbacks are examined closely you will see that a number of them are due to lack of vitamin A.

Under our seasonal conditions green feed supplies start to decline, both in quantity and quality, during the autumn months. During winter and spring, pigs normally get little green feed of good quality, and as a result the vitamin A stored in their bodies tends to be used up. As vitamin A is essential for good growth and health, exhaustion of the supply is reflected in slower growth, the onset of infertility troubles, and lowered resistance to disease so often seen during dry spring months.

To avoid these troubles, make sure your pigs get enough vitamin A during the winter and spring. If your pig pastures are poor during this period, try growing oats for grazing. A small paddock of lucerne for cutting and hand feeding is invaluable.

If you can't readily supply green feed, good quality leafy lucerne hay is an excellent substitute, as it builds up the vitamin content of the ration.

When no natural supplies of vitamin A are available, specially manufactured vitamin A supplements may be bought and used to avoid a deficiency.

—T. ABEL, Senior Adviser, Pig Branch.

bucket and bail

Dairy Breed for the Tropics.—Plans to develop a new tropical breed of dairy cattle in Queensland will get under way this year. Foundation breeding stock are available, and the former Ayr Regional Experiment Station is being re-organised for dairy production.

One of the Indian or Zebu dairy breeds and European cattle are to be used for this purpose.

The aim is to combine the ability of the Sahiwal to thrive in the tropics with the high production of European dairy cattle.

Development of an adapted tropical dairy breed could prove of major importance to dairy farming in central and northern Queensland.

For its breeding programme, the Agriculture Department has a purebred Sahiwal bull and two half-Sahiwal half-Jersey bulls. These animals are the progeny of Sahiwals introduced into Australia in 1952 and held permanently in quarantine in Melbourne. The bulls were given to the Department by the C.S.I.R.O.

First step in the breeding scheme will be to mate the Sahiwal and Sahiwal crosses with Jersey, Friesian and A.I.S. cows. The object will be to obtain progeny that combine most of the desirable qualities of the two types.

This work will then be followed by selection for production to give a type of animal capable of high milk yields in the tropics.

Sahiwal cattle originated in the Montgomery district of Pakistan and are also called Montgomery cattle. As a breed, the Sahiwal is about equal in bodyweight to the Guernsey. Sahiwal cattle are usually a reddish dun-colour, while dark brown and black points are common. Occasionally there are white patches on the body, but whole whites or greys are rare. This is in contrast to the beef-type Zebus in Australia. Like most Indian cattle, Sahiwals have a distinctive hump over their shoulders.

The Sahiwal is adapted to a hot climate and is one of the highest milk producers of all the Indian or Zebu breeds. Selected cows have produced up to 1,200 gal. of milk in a lactation. Butterfat content of the milk is reported to range from 4·3 per cent. to 6 per cent.

Tropical conditions in Australia adversely affect cattle in three ways. High temperatures may lead to a reduction in grazing time. On hot days, European cattle prefer to remain in the shade than to feed. External parasites, especially cattle ticks, cause production to drop, and constant dipping is necessary. The summer-growing grasses lose their protein content quickly after a brief growing season.

Work with Zebu crosses of beef cattle in Queensland's tropical areas indicates that crossbreds are better adapted to tropical conditions than pure European breeds.

The breeding scheme is a long-term project since it will take about three years to breed each new generation. But as the work progresses, the value of Zebu-cross dairy cattle in Queensland's tropical regions will be tested thoroughly.

Tropical Legumes in South, too.—Trials with tropical legumes last year indicated that some species may be suitable for districts far south of the actual tropics.

Six tropical legume trials were carried on during the year. The behaviour of these plants was studied in districts as far apart as the Atherton Tableland and Currumbin. The trials were under the direction of the Queensland Dairy Pasture Improvement Advisory Committee.

Townsville lucerne was showing promise as a legume component in bunch-type pastures like bunch spear grass. Its performance in pastures of this type was being studied in the Rockhampton, Gladstone, Bundaberg, Maryborough, Lower Wonga and Gatton districts.

This valuable legume can extend the grazing season well into the late autumn and early winter months. It is an annual summer legume, but its ability to come up from self-sown seed will ensure its spread on suitable coastal soils.

At Currumbin, near the Queensland border, four tropical legumes have given excellent summer forage yields. A centro-molasses grass pasture gave 13,068 lb. of air dry hay to the acre; stylo-molasses grass 11,616 lb.; Townsville lucerne-molasses grass 8,349 lb.; and Glycine javanica-molasses grass 6,534 lb. These yields point to the value of these legumes for frost free coastal ridges with medium levels of soil phosphate. Stylo has seeded freely in this trial and is spreading to other parts of the trial area. This spread is occurring without the help of fertilizers or cultivation.

The value of Glycine javanica for the red soils of the Atherton Tableland has already been amply demonstrated. But expansion in sowings is retarded by lack of commercial seed supplies.

Ample stocks of centro seed are now available and this legume is being widely used in dairy pastures in the Innisfail and Mackay districts. Centro is also being studied in the lower rainfall region around Rockhampton. On the high rainfall slopes at Cooroy and Nambour, excellent growth has been recorded in combination with molasses grass.

Important pioneer work with Desmodium uncinatum has been continued in the Gympie district. Four seed increase blocks and a grazing area have been established. Propagation by cuttings and locally harvested seed will permit widescale testing next season.

—*W. J. S. SLOAN,*
Director, Division of Plant Industry.

Purebred Herd Testing Rise.—More purebred dairy herds than ever before are now being production recorded in Queensland. In all, 331 purebred herds are under test. Under the purebred production recording scheme, 145 herds are being recorded, compared with 118 last year. A recent survey shows that a further 186 purebred herds are being production recorded under the group scheme.

In last year's 118 purebred herds, 1,936 cows were production recorded. This year, about 2,400 cows will be recorded under this scheme. The number recorded under the group scheme cannot be calculated until the season ends on September 30.

Of the stud dairy cattle breeders in Queensland, 27 per cent. are now production recording their herds. Of these, 12 per cent. are recording under the purebred scheme and 15 per cent. under the group scheme.

This shows that these breeders have recognised the value of production recording.

Herd recording is an accurate means of measuring each cow's yield in a particular season. It provides the information for comparing the merits of animals within a herd. This helps the studmaster in selecting his breeding stock and in planning breeding programmes. At the same time, it gives commercial dairy farmers selecting herd sires an accurate measure of a bull's production backing.

The increase in the number of stud breeders recording their herds is an encouraging sign. As greater use is made of the information coming from herd production records, the rate of improvement in the studs will be accelerated. This improvement will be passed on to the commercial herds using bulls from progressive studs.

Care of Leather Belting.—Leather machinery belts are still giving good service on many farms, despite the increased use of rubber, canvas and balata. The life of leather belts can be greatly prolonged if they are treated with castor oil every six months. This makes the leather supple, prevents mildew, discourages insects and vermin and reduces the tendency to slip. Before applying the oil, clean off any accumulated dirt or belt stick with petrol. Allow the petrol to evaporate completely.

—*C. G. WRAGGE, Agricultural Engineer.*

Strawberry Fruit Rots Can Be Controlled

By BARBARA L. WINKS, Pathologist,
and B. L. OXENHAM, Senior Pathologist.

Strawberries are affected by several fungal fruit rots in South Queensland but grey mould and Gloeosporium ripe fruit rot are by far the most serious.

The fungus (*Botrytis cinerea*) causing grey mould attacks a number of crops such as beans, tomatoes, lettuce and grapes. Cool, moist weather hastens the spread of the disease, and strawberry flowers, fruit stalks and fruit may all be affected.

The rot on the fruit first appears as a light brown, soft area which may extend to cover the whole fruit. If the weather remains humid the grey, fuzzy masses of spores are produced on the affected tissues, and these are readily spread by wind or on the pickers' hands.

Eventually only a dry leathery mummy remains of the fruit, and small, black, fungal resting bodies known as sclerotia may be formed. These fall to the soil where they remain until conditions again favour the spread of the disease.

Both the green and ripe fruit may be attacked, particularly if they are sheltered under the leaves and in close contact with old, rotting fruit, flowers and leaves. The fungus can also spread by contact from fruit to fruit once they have been harvested and packed.

Although moist, showery weather during winter and spring is required to start a grey mould outbreak, once there is an abundance of rotting material under the bushes the disease may progress even during subsequent dry weather. Dews and irrigation water apparently provide enough moisture to continue the infection cycle. Close planting and poorly-drained soil shaded by adjacent trees will also tend to increase grey mould.

Gloeosporium Ripe Fruit Rot

Gloeosporium ripe fruit rot is also caused by a fungus (*Gloeosporium* sp.) and like grey mould attacks the flowers and fruit. The leaf and flower stalks may also be infected and dark sunken areas produced.

Although the fungus may infect green fruit it does not produce symptoms until the fruit ripen. Circular, brown to dark-brown patches then develop on the fruit. These may be up to half an inch in diameter and are firm, somewhat shrivelled and slightly sunken. Some white fungal growth may develop on the spots during moist weather. Small pink masses of spores develop on the surface of the spots and these are splashed about by rain and spray irrigation, or distributed during picking.

Warm weather favours the development of Gloeosporium fruit rot and it does not become common until the spring and early summer. It usually reaches a peak in October-November.

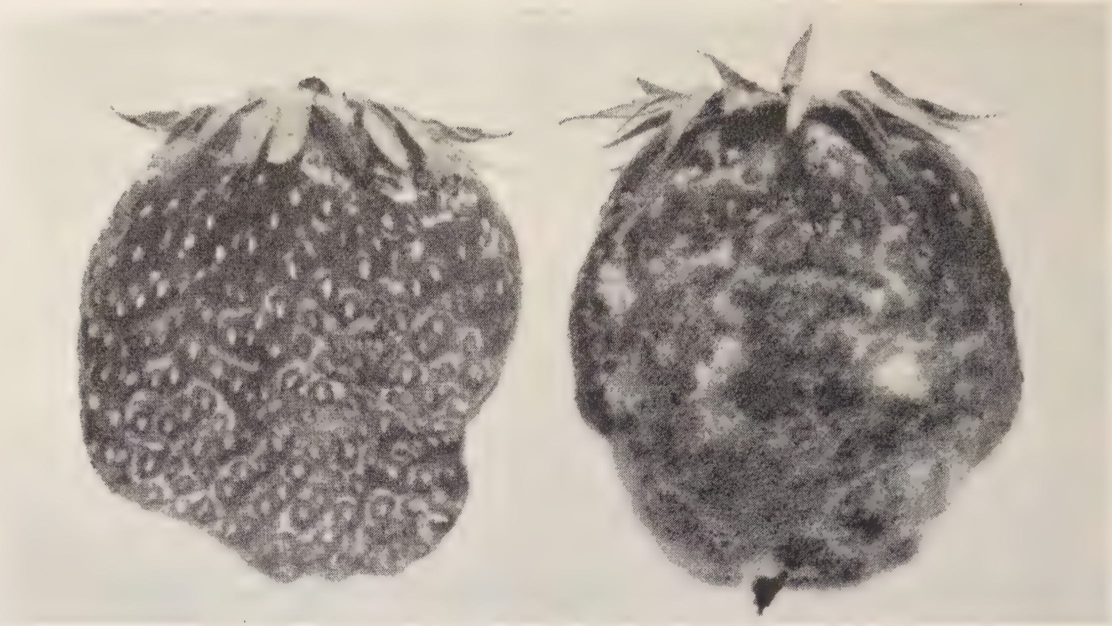


Plate 1

Healthy Fruit on Left, Fruit with Grey Mould on Right. Note the fuzzy masses of spores on the fungal growth.

Control

An experiment conducted at the Redlands Experiment Station in 1959 showed that good control of grey mould and Gloeosporium fruit rots can be obtained by regular, fortnightly spraying with a fungicide, captan. Zineb, maneb and copper oxychloride were also tested but captan was outstanding.

Weather conditions during the winter and spring of last year particularly favoured fruit rot development, and a 50 per cent. increase in yield of marketable fruit over the unsprayed plots was obtained by the use of captan. This may be attributed, not only to protection of the developing fruit, but also to the prevention of flower blight. There was also a general reduction in the amount of rotting plant material in the captan treated plots.

In this experiment the plants were sprayed every two weeks from the commencement of fruiting. It may be possible in practice, however, to delay spraying until the first sign of grey mould development and then to spray at 10-14 day intervals while weather conditions favour the disease. On farms where Gloeosporium fruit rot is a problem, regular captan spraying should be carried out from early September until the end of the main fruiting season.

The concentration of captan used is 2 lb. of the 50 per cent. product to 100 gal. of water. This is the equivalent of 1 oz. to a 3½ gal. knapsack sprayer.

The strawberry is a close-growing plant and it is important to direct the spray under, as well as on top of, the foliage, so that a complete cover is obtained. Regular spraying is important while weather conditions favour disease development. Such fungicides as captan are protective in nature and a constant deposit is necessary on the plant to prevent infection.

In addition to spraying it is also important to practice crop rotation, select a well-drained site

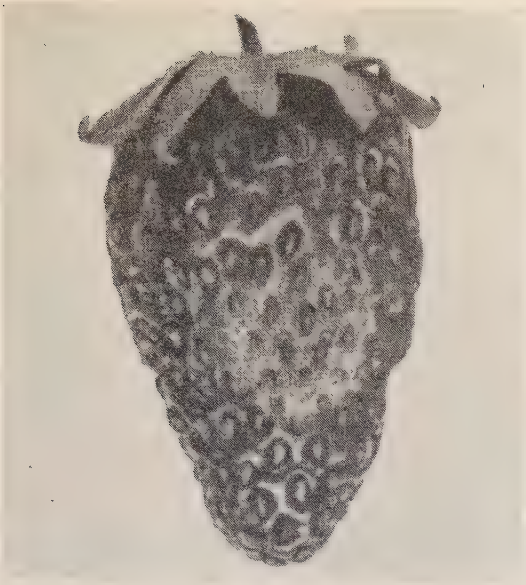


Plate 2

Gloeosporium Ripe Fruit Rot. A little white fungal growth may develop on the brown spots during moist weather.

for planting and carry out bedding, mulching and hygiene. Rotting fruit should be promptly removed from the patch and any blemished fruit should be excluded during packing.

Control measures may be summarised as follows:

1. Regular and thorough spraying with captan (2 lb./100 gal.) at 10-14 day intervals.
2. Land selection.
3. Crop rotation.
4. Bedding and mulching.
5. Suitable plant spacing to avoid overcrowding.
6. Hygiene during picking and packing.
7. Prompt marketing.

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Elliott, A. G., "Ooraine", Dirranbandi
Mayne, W. H. C., "Gibraltar", Texas

A.I.S.

Cox, T. L. & L. M. J., Seafield Farm, Wallumbilla
Crookey, J., Arolla A.I.S. Stud, Fairview, Allora
Davis, W. D., "Wamba", Chinchilla
Dennis, L. R., Diamondvale A.I.S. Stud, Mundubbera
Edwards Bros., "Spring Valley" A.I.S. Stud, Kingaroy
Evans, E. G., Lauraven A.I.S. Stud, Maleny
Green, D. B., Deloraine A.I.S. Stud, Fairdale
Heading, C. A., "Wilga Plains", Maleny
Henry, Mrs. K., Greenmount
Henschell, W., "Yarranvale", Yarranlea
H. M. State Farm, Numinbah
Littleton, H. V., "Wongalea", Hillview, Crow's Nest
Marquardt, A. C. & C. R., "Cedar Valley", Wondai
McShane, A. H., Handford Road, Zillmere
Mears, G. S. & E., "Morden", M. S. 755 Toogoolawah
Moore, S. R., "Sunnyside", West Wooroolin
Neale, D. G., "Groveley", Greenmount
O'Sullivan, Con., "Navillus", Greenmount
Power, M. F., "Barfield", Kapaldo
Messrs. Mitchell and Mulcahy, Rosenthal
Queensland Agricultural High School & College, Lawes
Radel, R. R. & Sons, "Happy Valley", Coalstoun Lakes
Roche, C. K., Freestone, Warwick
Sanderson, W. H., "Sunlit Farm," Mulgildie
Schloss, C. J., "Shady Glen", Rocky Ck., Yarraman
Scott, M. E. & E., "Wattlebrae" A.I.S. Stud, Kingaroy
Scott, W. & A. G., "Walena" A.I.S. Stud, Blackbutt
Shelton, R. A. & N. K., "Vuegon" A.I.S. Stud, Hivesville, Murgon
Sokoll, A. H., "Sunny Crest", Wondai
Sperling, G., "Kooravale", Kooralgin, Cooyar
Sullivan Bros., "Valera", Pittsworth
Sullivan, D., "Bantry", Pittsworth
Sullivan, F. B., "Fermanagh", Pittsworth
Thompson, W. H., "Alfavale", Nanango
Webster, A. H., "Millievale", Sabine, via Oakey
Wieland, A. W., "Milhaven", A.I.S. Stud, Milford, via Boonah

Ayrshire

Dudgeon, C. E. R., Marionville Ayrshire Stud, Landsborough
Dunn, T. F., "Alanbank", Gleneagle
Goddard, B., Inverell, Mt. Tyson, via Oakey
Holmes, L., "Benbecula", Yarranlea
Mathie, E. & Son, "Ainslie", Maleny
Scott, J. N., "Auchen Eden", Camp Mountain
Zerner, G. F. H., "Pineville", Pie Creek, Box 5, Post Office, Gympie

Friesian

Behrendorff, E. C., Inavale Friesian Stud, M.S. 786, Boonah
Macdonald, S. E. G., "Freshfields", Marburg
Naumann, C. H., "Yarrabine", Yarraman
Pender, D. J., Lytton Road, Lindum
Stumer, A. O., Brigalow, Boonah

Guernsey

Doss, W. H., Degilbo, via Biggenden
Fletcher, A. B., "Cossart Vale", Boonah
Holmes, C. D. (owner Holmes L. L.), "Springview", Yarraman
Johnson, G. L., "Old Cannindah", Monto
Miller, G., "Armagh Guernsey Stud", Armagh, M.S. 428, Grantham
Ruge, A. & Sons, "Woowoonga", via Biggenden
Sanderson, N. H., "Glen Valley", Monto
Scott, C., "Coralgrae", Din Din Rd., Nanango
Swendson, A. C., Coolabunia, Box 26, Kingaroy
Wissemann, R. J., "Robnea", Headington Hill, Clifton

Jersey

Beckingham, C., Trout's Rd., Everton Park
Birt, W. C. M., Pine Hill Jersey Stud, Gundiah
Borchert, Mrs. I. L. M., "Willowbank" Jersey Stud, Kingaroy
Burrows, R. N., Box 23, Wondai
Bygrave, P. J. L., The Craigan Farm, Aspley
Carpenter, J. W., Flagstone Ck., Helidon
Conochie, W. S. & Sons, "Brookland", Sherwood Rd., Sherwood
Crawford, R. J., Inverlaw, Kingaroy
Farm Home For Boys, Westbrook
Fowler, P. & Sons, "Northlea", Coalstoun Lakes
Harley, G., "Hopewell", M.S. 189, Kingaroy
H.M. State Farm, Palen Creek
Hutton, D. R., "Bellgrath", Cunningham, via Warwick
Johnson, H. G., Windsor Jersey Stud, Beaudesert
Lau, J. F., "Rosallen", Goombungee, Toowoomba
Matthews, E. A., "Yarradale", Yarraman
McCarthy, J. S., "Glen Erin", Greenmount, Toowoomba
Meier, L. E., "Ardath Stud", Boonah
Noone, A. M. & L. J., "Winbirra", Mt. Esk Pocket
Porter, F., Conondale
Q.A.H.S. & College, Lawes
Ralph, G. H., "Ryecome", Ravensbourne
Scott, Est. J. A., "Kiaora", Manumbar Rd., Nanango
Semgreen, A. L., "Tecoma", Coolabunia
Seymour, B. T., "Upwell" Jersey Stud, Mulgildie
Smith, J. A. & E. E., "Heatherlea" Jersey Stud, Chinchilla
Tatnell, W. T., Cedar Pocket, via Gympie
Toowoomba Mental Hospital, Willowburn
Verrall, F. W., "Coleburn", Walloon
Weldon Brothers, "Gleneden" Jersey Stud, Upper Yarraman

Poll Hereford

Anderson, J. H. & Sons, "Inverary", Yandilla
Hutton, D. R. & M. E., "Bellgrath", Cunningham, via Warwick
Maller, W., "Bore View", Pickanjinnie
Maller, W., "Bore View", Gowrie Junction
McCamley, E. W. G., "Eulogie Park", Dululu
Wilson & McDouall, Calliope Station, Calliope

Poll Shorthorn

Leonard, W. & Sons, Welltown, Goondiwindi
Yamburgan Pastoral Company, Noondoo

What The Fruit Grower Should Know About Quality And Maturity—I

By T. HOPE, Chemist, Horticulture Branch.

This discussion on fruit quality and maturity is designed to help the grower to harvest his fruit at the most favourable stage of maturity. All growers should have some knowledge of fruit quality, the process of maturation and how these are affected by environment, particularly the environment which can be controlled.

Quality is used to describe the characteristics of fruit that pertain to edibility and refers to fruit eaten in a fresh or cooked condition. For instance, certain varieties of apples may have good cooking but poor eating quality or vice versa.

Chemical determinations of the sugar and acid content of fruit can be made, but such measurements are rarely indices of quality; for example, one variety of apple may have more sugar than another but may be sour to the taste because it has a greater acid content. The acid-sugar ratio is of some importance in determining eating quality, but flavour, odour and crispness, outweigh this factor. The kind of sugar present could have some bearing on taste, as cane sugar is sweeter than glucose. Astringency is important; very astringent fruit has a harsh acid taste, while fruit with a low astringency has a milder and sweeter taste. Perhaps the most important attributes of eating quality are flavour and odour due to certain esters, essential oils and other chemical compounds. The pleasant fruity smell can influence the taste buds, and an apple with a pleasant aroma will have a more pleasant taste than one devoid of smell. Packing in unseasoned cases with a strong pine smell, and storage in sheds containing fertilizers, in badly ventilated and musty rooms or with products such as potatoes or onions, cause contamination which will completely mask the natural flavour of the fruit.

The actual water content of fruit can affect eating quality, as badly shrivelled fruit lacks crispness and juiciness.

The cells of fruit are cemented together with pectin compounds and the insoluble pectin fraction gradually breaks down to soluble pectin as the fruit matures. If there has been little breakdown of insoluble pectin the cells are kept together until the fruit is crisp and juicy. When much of the insoluble pectin is broken down the cells tend to separate readily. This, for example, is the cause of a floury or mealy texture in apples. Some fruits have thick cells, some large cells, while others contain fibre, pith, or cork, which influence crispness.

The amount of colour, bloom and other attributes of appearance are psychological factors which influence taste considerably. A bright red apple will have more appeal than a dull green-yellow one, which is generally associated with cooking.

Edibility can only be determined satisfactorily by taste, which may vary with the individual concerned; it is, however, a more reliable index of fruit quality than any chemical or physical measurement. Such factors as leaf surface, light, water supply, temperature, leaf-fruit ratio, fertilizers, hormones, weather conditions and cultural methods all influence fruit quality prior to harvesting. Handling treatments, transit, marketing and storage conditions, affect quality after harvesting.

Maturity

Much produce reaching the market each season is greatly impaired in quality because it has been picked at the wrong stage of maturity. Varietal characteristics, seasonal variation, cultural practices and other factors affect the date at which the crop becomes mature. The optimum stage of maturity at which the crop should be picked varies from type to type and depends largely on the variety, the speed and method of handling and the ultimate disposition of the crop.

Fruits such as grapes, oranges, pineapples and passion fruit, which contain no starch, will not ripen after picking, and in consequence they must be harvested in a firm ripe condition. Peaches, plums, apples and papaws, which contain some starch, can be picked in a slightly immature condition but must reach the market nearly ripe enough for eating but firm enough to be handled through the normal channels of trade. Bananas and pears contain considerable starch which is converted into sugar on ripening; these fruits are picked when they are fully grown but still hard and firm.

Plate 1

Mr. T. Hope, Chemist in Horticulture Branch of the Department of Agriculture and Stock Uses a Juice Extractor in His Work on Fruit Quality.

If fruit is to be sold on the fresh fruit market soon after harvesting it can be picked in a mature condition. If it is destined for distant markets or transit temperatures are high, it has to be picked less mature. If long storage is intended, then maturity becomes a very important factor, as immature fruit is susceptible to skin blemishes and over-mature fruit is subject to mould and breakdown. Fruit to be used for canning should have developed its maximum flavour. Slight over-ripeness may not be a disadvantage. For quick freezing the stage of maturity is critical, as abnormal flavours will develop if the fruit is slightly immature or over-mature.

The grower has to judge largely by his own experience when fruit is sufficiently mature for market or factory and must take into consideration pre-and post-harvesting conditions. Deterioration proceeds more rapidly after harvesting than before it and is greatly increased by high temperature. In selecting the actual stage of maturity for market the grower should take into account the prevailing temperatures, the period of time between harvesting and the final point of sale. Deterioration is much faster in summer than in winter and transit temperatures in tropical zones are usually much higher than in temperate and sub-temperate zones.

Fruit is composed of a mass of living cells, each its own chemical laboratory, where food and nutrients from the parent tree are converted by means of complex chemical processes to the substance of the fruit. Factors such as soil type, climate, cultural practice and incidence of disease, determine whether the tree will bear fruit, the time it will bear, the extent of the maturation period, and the yield and quality of the crop.

Influence of Climate

For most types of fruit the period between bloom and full maturity is shorter the higher the temperature during that period. The degree to which maturation is accelerated by high temperatures varies with the variety or species.

The duration of temperatures sufficiently high for normal growth determines whether fruit will mature and subsequently ripen. If the period of high temperatures is short and is followed by one of low temperature, the fruit is lacking in flavour.

The green ground colour of apples is due to chlorophyll. During the late stages of maturation if temperatures remain high the green ground colour tends to persist, whereas when lower temperatures prevail apples of the same variety begin to lose ground colour earlier. In fruits where an orange colour indicates ripening, there is more orange colour in fruits allowed to remain on the tree than in those picked early and allowed to ripen subsequently.

In some fruits the red colour will not develop without direct sunlight; consequently this colour is very deep in fruit on the sunny side of the tree. Where fruit is shaded from the sun by leaves or other fruit, there is little development of red colour in some species. Excessive nitrogen can cause a profuse growth of leafy shoots which will shade the fruit and thus delay development of red colour.

Some varieties of apples and peaches tend to develop a greater amount of red colour if the weather conditions during maturation are cool and sunny.

Where ultra-violet light is necessary for the development of red colour, winds producing dust, or a hazy atmosphere, both of which absorb ultra-violet light, will delay its development.

Palatability is influenced by rainfall. If the fruit tissue is deficient in moisture, the cell walls may be thick and therefore coarse to eat. Adequate rainfall produces more juicy and translucent fruit.

Soil Type and Cultural Practices

Fruits have a tendency to mature earlier on trees growing in sandy and gravelly soils than on those growing in clay soils. Deficiency of nitrogen causes an early cessation of growth and hastens the process of fruit maturation.

Old trees tend to cease summer growth and produce mature fruit earlier than younger trees of the same variety.

Where a species of tree requires sunlight to develop the red colour of its fruit, thinning to prevent fruits from shading one another will often accelerate maturation. Deep red colour is usually associated with high sugar content. Sometimes the deep red colour will not develop rapidly in some fruits because the tree has a large crop in proportion to its leaf surface and is therefore incapable of producing an adequate supply of sugar by photosynthesis. Delay in maturation and development of red colour may also be due to excessive nitrogen. Trees with an abundance of nitrogen, but growing on shallow soils, or under conditions which prevent the development of foliage, may still fail to develop red colour. Trees growing on clay soils which are too compact for root production may be deficient in leaf growth, in spite of an abundance of nitrogen, and thus fail to produce the sugars essential to anthocyanin development and mature flavour.

Nitrogen supply and soil quality may affect the aromatic constituents of certain types of apples. These fruits tend to have a more aromatic flavour if the trees are in deep, well-aerated soils than when grown on a clay soil which is badly aerated. In such cases fully developed fruit fall before they are sufficiently palatable and there is a tendency to harvest prematurely. Sweetness and flavour will therefore be lacking.

Process of Maturation

In the first stage of cell division the amount of acid produced increases to a maximum, sugar content remains rather low, and the final size of the fruit is determined to a large extent.

The next stage of cell enlargement is concerned with a gradual increase in moisture, juice and sugar. During this period external colour remains constant except for negligible improvements in shade.

In the next stage of development—the maturation phase—external and internal colour changes rapidly, the cells containing the juice sacs increase in size, sugars continue to increase at the expense of acids, and there is a gradual increase in the tenderness of the flesh. Flesh which was coarse and opaque assumes a more delicate and translucent appearance. Probably the most important feature during this stage is a rapid development of the aromatic constituents which give the particular aroma and flavour to a variety or type of fruit.

Type of Fruit Popular with Consumer

The consumer prefers fruit at that stage of maturity where flavour and quality are excellent. In some fruits this stage can only be reached while the fruit is on the tree. The grower cannot always allow fruit to ripen on the tree because considerable deterioration in quality will occur during transit and the ripe fruit would not withstand the normal handling of distribution. In such cases fruit should be allowed to remain on the tree until it acquires good quality but is in such a condition to withstand handling and transport.

The degree of ripeness for harvesting will depend upon whether the fruit is intended for local or distant markets, climatic conditions, the nature and quality of the fruit during a particular season, and other factors which affect keeping quality.

[TO BE CONTINUED]

Hints For The Farm Wife

Stop steel wool rusting by keeping it in a jar of water to which half a teaspoonful of bicarbonate of soda has been added.

Dip mint in vinegar before chopping for mint sauce and it will keep its bright green colour.

Remember raw rice trebles its bulk when cooked, so if a recipe needs one cup cooked rice, only use one-third cup raw rice.

Laundry blue in the washing-up water will make glassware sparkle.

Try using onion juice to restore lustre to tarnished silver.

To give whitewashed walls a glossy finish dissolve a pound of soap in a gallon of hot water and add to five gallons of whitewash.

Best Recipe of The Month

Chili Con Carne (with beans).—Brown Beauty beans, beef suet, onion, garlic, beef, tomatoes, chili, cumin.

Soak 2 cups of Brown Beauty beans in water overnight. The next morning, drain them, cover with fresh water, and simmer them gently until they are almost tender.

Melt 3 tablespoons of chopped beef suet in a deep, heavy pot and add 1 large chopped onion and 2 minced cloves of garlic. When the onion begins to brown, add 1 lb. of lean beef, cut in ½ in. cubes and brown the meat quickly to seal in the juices. Blend 1 tablespoon of flour and add 2½ cups of tomatoes and 1 cup of water in which the beans were cooked. Add 1 teaspoon of salt, 1-3 tablespoons of chili powder to taste (or 2 to 4 ground chili peppers), simmer the chili, covered, for 1 hour; then mix in the beans, drained, and taste for seasoning. Cook the chili for another 30 min., stirring occasionally, but do not let the beans get soft or broken.

Chili con carne, like a good stew, improves in flavour if it is set aside for about 12 hours and is reheated before serving. Serves four to six.

Solving Problems Of Flying Chickens To New Guinea

By P. D. RANBY,
Veterinary Officer.

Over 50,000 chickens are transported by air from Queensland to New Guinea each year. These chickens were formerly carried by D.C.4 aircraft, but now Superconstellations are used. After leaving the Australian mainland, the Superconstellations stop first at Port Moresby and then continue over the range to Lae. Chickens sent on to other centres in New Guinea must then transfer to D.C.3 and D.C.4 aircraft, the cargo lockers of which are influenced by outside air temperatures.

The day-old chickens are packed into two-unit cardboard boxes, each box holding 50 birds (see Plate 1). Only new, unused boxes are used—as required by the New Guinea authorities. The boxes are packed in stacks of five or six in the locker of the aircraft, and the lid of each box bears two ridges to support the next box above, thus allowing an air-space between them.

Although air-transport of day-old chickens to New Guinea has been generally satisfactory, some problems have arisen as follows:

- Ill-effects of air-travel on the chickens as a result of temperature changes, poor ventilation and oxygen lack.
- Discomfort to passengers caused by foul odours originating from the packed chicken boxes.
- Prevention of certain transmissible diseases.
- Irregular bookings in relation to hatching dates.

Ill-effects on the Chickens

Possible ill-effects of air-transport on the chickens are rapid temperature changes in unpressurized aircraft, poor ventilation in the locker and oxygen lack due to low air pressure.

The main season for the New Guinea chick trade lasts from March to September, and it is the occasional batch of chickens sent after September or October that suffers ill-effects from temperature changes. Batches of these late chickens have arrived at Lae in a "groggy" condition. Heavy losses have then followed, mainly on the second and third day after arrival.

A check by the air-transport authorities showed that these chickens always arrived in good condition at Port Moresby, yet they would show ill-effects at Lae. It was then suspected that chilling of the chickens in the luggage locker might occur during the aircraft's "hop" over the Owen Stanley Ranges after leaving Port Moresby.

It is of interest here that overheating of the chickens would be likely during the aircraft's one-hour stay at the airport in Port Moresby. During the later months of the year, high temperatures prevail and the aircraft becomes a "sweat box" while on the ground. Temperatures up to 130 deg. F. are possible in the aircraft under these conditions. Then within 15 min. of take-off, cold temperatures in the locker would be expected, as the aircraft gained altitude to cross the mountain range. The Owen Stanleys form a high plateau at 9,000 feet or more. The air-temperatures at these higher altitudes are variable, but occasionally cold streams of air are encountered.

Thus we would have, firstly *overheating* of the chickens on the ground, followed by *chilling* in the air. The rapid fall in temperature could bring about congestion of the chicken's lungs, with ill-effects lasting a few days.

Lack of oxygen at higher altitudes is probably not serious to the chickens in unpressurized aircraft, since the D.C.3's and D.C.4's do not fly much above 7,000 feet. This altitude is not distressing to man. However, the slight shortage of oxygen in the atmosphere could aggravate poor ventilation of the chickens.

Poor ventilation in the locker could be brought about by suitcases and other luggage being packed too closely around the chick boxes. Poor ventilation will itself result in a shortage of oxygen as well as an accumulation of moisture from the breaths of the chickens.

The following case which occurred some years ago points to poor ventilation effects:

One consignment of 500 chickens from Brisbane arrived at Rabaul, New Britain, in a collapsed state. It was reported that the aircraft was forced to fly at high altitude over a storm between Port Moresby and Rabaul.

The consignee unloaded the chickens as soon as they arrived at the airport. They were consigned in 10 boxes each holding 50 chickens.

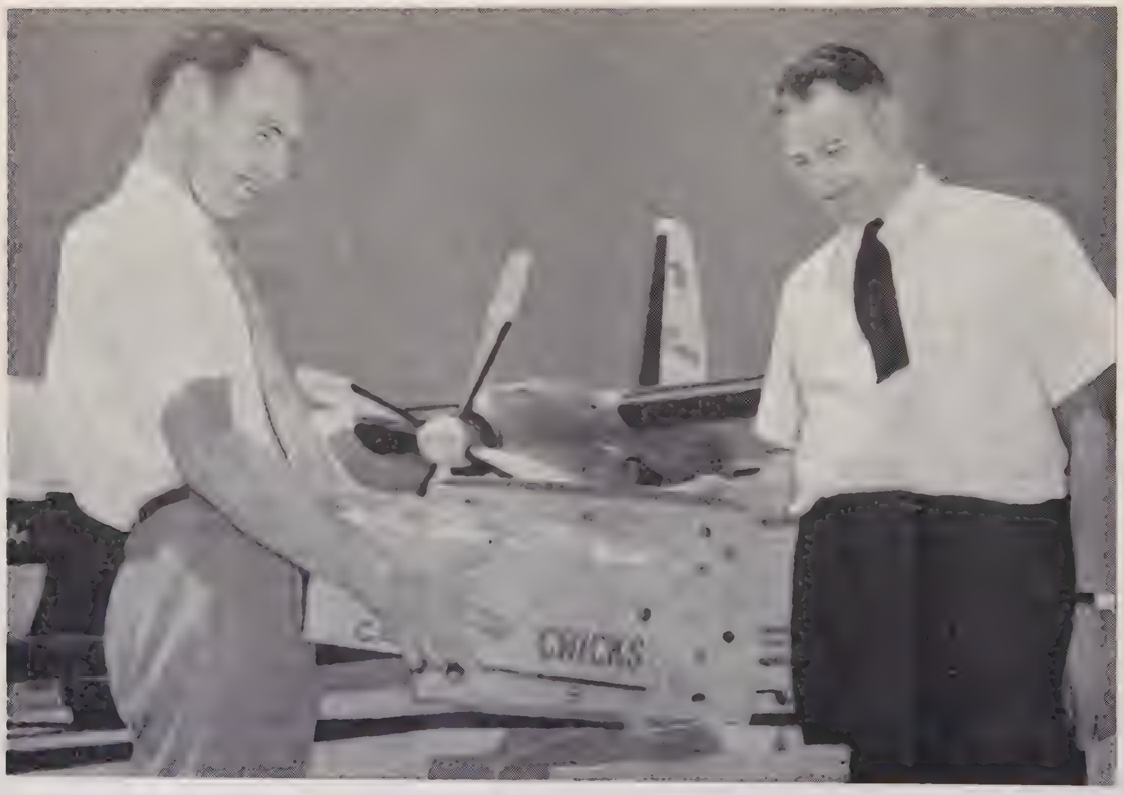

Plate 1

Chickens Packed for the Air Journey to New Guinea. Each of the two-unit cardboard boxes contains 50 chickens. At the bottom of the picture can be seen the two ridges which, when the box is stacked in the locker of the aircraft, support the box above, thus allowing an air space between them. Note also the large number of holes in the lid of the box, held by Mr. R. Fox, T.A.A. Despatch Officer, at right. On the left is Mr. P. D. Ranby, Departmental Veterinary Officer.

When the consignee discovered the condition of the chickens, he quickly removed the lids from all boxes. Only a few "groggy" chickens showed any signs of life. The remainder were collapsed as if in a state of coma. After a short time, however, signs of life reappeared and many of the chickens recovered. In all, 65 of the 500 chickens had died (13 per cent.).

Most of the dead ones were in the lower boxes, which were arranged in two stacks of five. Faulty ventilation may have resulted in the boxes at the bottom of the two stacks. The lower oxygen supply at the higher altitude was probably only a contributing factor. Ventilation could have been hindered by the placement of bags and other luggage too close to the chick boxes.

Air-freight authorities are now conscious of the need for good ventilation in respect to chickens. With the recent use of Superconstellation aircraft for transporting chickens to New Guinea, the dangers of overheating, chilling, and oxygen lack should be greatly reduced. These aircraft are pressurized, while the luggage lockers of a number of them are heated and ventilated.

It is wise to increase the number of air-holes in the lids of chick boxes going to New Guinea in order to increase ventilation. Some exporting poultry farmers carry out this measure.

Odour Problem

Fortunately, foul odour trouble in air-transported chickens is uncommon. Odour trouble originating from the chickens is only likely to be troublesome on certain aircraft, particularly D.C.3's, and on the interstate runs, the Fokker "Friendships". The latter type of aircraft has not been used for flying chickens to New Guinea but is now the chief one used for carrying chickens interstate in Australia.

Occasional bad odour consignments have come to notice. The following are examples:

One consignment from Sydney to New Guinea was off-loaded at Brisbane due to a foul smell. On opening the boxes, the chickens were found to be wet as if "sweated". Many were weak and some of them had died. Pieces of egg-shell were still attached to several of the birds, one having a piece nearly covering its back. Without doubt, the chickens had been packed into the boxes while still wet after hatching. This consignment was sent back to Sydney.

On several occasions, chickens affected by omphalitis (or yolk-sac infection) have caused a foul odour. Baby chickens affected by this disease have a notorious foetid smell and putrefy very rapidly after death.

In one such batch of chickens consigned to New Guinea, the odour penetrating the cabin caused the birds to be unloaded at Brisbane. About 10 per cent. of the chickens appeared to be sick and several were dead. To avoid inconvenience by returning this cargo, the airport authorities removed affected chickens and sent the boxes on to New Guinea with a covering letter for the consignee.

Another consignment for New Guinea having an unpleasant smell was found to be packed in previously used chick boxes. The boxes contained collections of excreta from previous chickens and were dirty inside. Moisture from the chickens had dampened the dried excreta, thus producing the odour. This shipment was returned to the hatchery concerned.

Bad odours in chickens transported by air are easily avoided where the hatchery of origin exercises reasonable care. Boxes should be clean. The chickens should be dry and fluffy before packing them. Sick or dopey chickens should be removed in case they are affected by omphalitis.

Transmissible Diseases

Chickens sent by air to New Guinea must comply with requirements in regard to certain diseases, notably pullorum disease and epidemic tremor (avian encephalomyelitis). Both these are egg-borne infections.

Since the breeding stock of all poultry hatcheries in Queensland are tested each year for pullorum disease, the prevention of this disease is relatively easy. Few hatcheries would fail to meet the requirements for the New Guinea trade as a result of this disease.

Irregular Bookings

Air-bookings for the New Guinea day-old chick trade are usually made months ahead. In fact, at the present time (February, 1960) the season has been almost booked out for the year. These bookings tend to be irregular, in that certain days are much more heavily booked than others. Hatchings, therefore, should be made to fit in with bookings and consequent luggage space available.

Brucellosis-Tested Swine Herds

(As at 1st May, 1960)

Berkshire

Clarke, E. J., Mt. Alford, via Boonah
Cochrane, S., "Stanroy", Felton
Cook, F. R. J., Middle Creek, Pomona
Crawley, R. A., Rockthorpe, Linthorpe
Edwards, C. E., "Spring Valley" Stud, Kingaroy
Farm Home For Boys, Westbrook
Fletcher, A. C., "Myola" Stud, Jimbour
French, A., "Wilson Park", Pittsworth
H. M. State Farm, Numinbah
H. M. State Farm, "Palen" Stud, Palen Creek
Handley, J. L., "Meadow Vale", Lockyer
Handley, G. R. "Lochlyn" Stud, Lockyer
James, I. M. (Mrs.), "Kenmore" Stud, Cambooya
Kimber, E. R., Block 11, Mundubbera
Law, D. T., "Rossvill" Stud, Aspley
Lees, J. C., "Bridge View" Stud, Yandina
Ludwig & Sons, A. R., "Beau View" Stud, Beaudesert
O'Brien & Hichey, J., "Kildurham" Stud, Jandowae East
Orange, L. P., "Hillview", Flagstone Creek
Pfrunder, P. L., Pozieres
Potter, A. J., Ascot, via Greenmount
"Tayfield" Stud, Taylor
Q.A.H.S. & College, Lawes
Regional Experimental Station, Hermitage
Rosenberger, N., "Nevrose", Wyreema
Schellback, B. A., "Redvilla" Stud, Kingaroy
Smyth, E. F., "Grandmere" Stud, Manyung, Murgon
Stark, H. L., "Florida" Stud, Kalbar
Thomas & Sons, F., "Rosevale" Stud, Laravale
Traves, G., "Wynwood" Stud, Oakey
Weier, V. F., "La Crescent", Clifton
Wolski, A., "Carramana", Warra
Young (Jnr.), W., Kybong, via Gympie

Large White

Assenbruck, C., Mundubbera
Barron Bros., "Chiltern Hill", Cooyar
Bell & Son, E. J., "Dorne", Chinchilla
Butcher, Dr. B. J. & Parnwell, A. J., Plunkett, via Tamborine
Clark, L. D., Greens Creek, Gympie
Duncan, C. P., "Colley", Flagstone Creek
Fowler, S., "Kenstan", Pittsworth
Franke, H. J., "Delvue" Stud, Cawdor
Garawin Stud Farm Pty. Ltd., 657 Sandgate Rd., Clayfield
Gibbons, A. E. H., Mt. Glorious
Gibson, H., "Thistleton" Stud, Maleny
H. M. State Farm, Numinbah
Hall, M., "Milena" Stud, D'Aguilar
Heading, J. A., "Highfields", Murgon
Horton, C. J., "Mannuem Brae" Stud, Mannuem, Kingaroy
Hutton, G., "Grajea" Stud, Cabarlah
Jensen, S., Rosevale, via Rosewood
Jones, K. B., "Cefn" Stud, Clifton
Kahler, J. & S., "Karajoy", East Nanango
Kanowski, A., "Exton", Pechey
Kennard, R. B., "Collar" Stud, Warwick
Larsen, H. L., "Oakway" Stud, Kingaroy
Law, D. T., "Rossvill" Stud, Aspley
Lees, J. C., "Bridge View", Yandina
Lobegeiger, L. C., "Bremer Valley" Stud, Moorang, via Rosewood
Mack, A. J., Mundubbera
Neilsen, L. R., "Sunny Hill," Ascot, via Greenmount
Neilsen, A. R., Ascot, via Greenmount
Palmer, V. P. & Son, "Remlap", Greenmount
Pampling, G., Watch Box Rd., Goomeri
Postle, R., "Yaralla" Stud, Pittsworth
Powell, R. S., "Kybong", Gympie
Q.A.H.S. & College, Lawes
Radel, V. V., Coalstoun Lakes
Radel, R. M., Coalstoun Lakes
Regional Experimental Station, Biloela
Robinson, O. R. & O. J., "Linvale", Argoon, Biloela
Skyring, G. I., "Bellwood" Stud, via Goomeri
Stanton, H. R., "Tansey" Stud, via Goomeri
Stewart, L., Mulgowie, via Laidley
Stumer, K. F., French's Creek, Boonah
Wharton, C. A., "Central Burnett" Stud, Gayndah
Wieland, L. C. & E., Lower Cressbrook, Toogoolawah
Zahnow, W., Rosevale, via Rosewood

Tamworth

Armstrong, H. J., "Alhambra", Crownthorpe, Murgon
Booth, J. D., Swan Creek, Warwick
Campbell, P. V., "Lawnhill" Stud, Lamington
Coller, R. H., Tallegalla, via Rosewood
Fletcher, A. C., "Myola" Stud, Jimbour
Herbst, L., "Hillbanside", Bahr Scrub, Beenleigh
Kanowski, S. E., "Miecho", Pinelands
Potter, N. R., "Actonvale" Stud, Wellcamp
Regional Experimental Station, Kairi
Salvation Army Training Home For Boys, "Canaan" Stud, Riverview
Skerman, D. F. L., "Waverley", Kaimkillenbun
Stephen, T., "Withcott" Stud, Helidon
Thomas & Sons, F., "Rosevale" Stud, Laravale
Wieland, L. C. & E., Lower Cressbrook, Toogoolawah

Wessex Saddleback

Ashwell, J., "Green Hill", Felton South
Cooper, G. J., Neumgua
Douglas, W., "Greylight" Stud, Goombungee
Dunlop, J. B., "Kunawyn", Acacia Rd., Kuraby
Kruger & Sons, "Greyhurst" Stud, Goombungee
Law, D. T., "Rossvill" Stud, Aspley
Mack, A. J., Mundubbera
Scott, A., Wanstead Stud, Grantham
Smith, C. R., "Belton Park", Nara
"Wattledale" Stud, 432 Beenleigh Rd., Sunnybank

Large Black

Pointon, E., Goomburra

Landrace

Grayson, D. G., Killarney
Neilsen, A. R., Ascot, via Greenmount
Orange, L. P., "Hillview," Flagstone Creek

Looking After Our Wildlife

By C. ROFF, Fauna Officer.

Interest in native animals and birds is deeply rooted in the minds and emotions of a broad cross-section of people. It manifests itself in such widely different individuals as those who enjoy indiscriminate shooting and those who are ardent naturalists and desire total protection for all living creatures. In a normal community a course between these two extremes is desirable.

Queensland has developed rapidly. Consequently, swamps which are the home of the waterfowl have been drained and natural haunts of other fauna have been destroyed. The numbers of hunters and trappers have increased, faster transport is available to remote areas, and generally there is more leisure time. All these have affected our wildlife.

Native fauna is at all times the property of the State, and the Department of Agriculture and Stock is responsible for conserving this fauna. However, the best commercial use should be made of our animals and birds and the legitimate needs of sportsmen must be met, but at the same time aesthetic values cannot be ignored. Furthermore, some of our wildlife may at times be a nuisance, others are pests in industries, and a few are carriers of disease of man and domesticated animals.

Obviously, fauna conservation is a complex subject covering several inter-dependent aspects such as wildlife studies, education and legislation. This article, however, will deal only with the legislative requirements of fauna conservation in Queensland.

Fauna Legislation

Originally, the right of man to hunt animals for food and sporting purposes was a natural one wholly unrestrained by law. With increases in human population it became necessary to abridge or restrict this natural right to ensure an adequate supply of animals for food. This early change in outlook was not sudden and over the centuries has evolved still further. To-day, in all civilised countries the taking of native fauna is, for most people, a controlled privilege and not an inherent right.

Fauna legislation was first introduced in Queensland in 1877, when certain game and insectivorous birds were protected. In 1898, further legislation was passed to provide for the introduction, acclimatisation and preservation of birds and animals deemed to be of economic value to the State.

In 1906, legislative provision was made partly protecting koalas and possums, and in 1910 greater restrictions were placed on the taking of these animals.

The first comprehensive Fauna Act was *"The Animals and Birds Acts,* 1921 *to* 1924," which listed the fauna to be covered by the Act, fixed periods of protection, prohibited the sale of, and prescribed open seasons for specified animals and birds, and declared lands to be sanctuaries.

This Act was replaced by *"The Fauna Protection Act of* 1937," which in due course was consolidated as *"The Fauna Conservation Act of* 1952." This current legislation was drafted to meet present-day requirements and was proclaimed on 1st January, 1954. It is divided so that interlocking provisions are combined under suitable part headings. This will facilitate administration and should help the public towards a clearer and therefore better understanding of fauna legislation. The Act will be discussed here under the various divisions.

Definitions

It is provided that all actions, proceedings, sanctuaries and appointments made under the repealed *"Fauna Protection Act of* 1937," are legally continued under *"The Fauna Conservation Act of* 1952."

Various terms are defined and it is particularly important to note the following definitions:—

"Appliance"—Any means whatsoever used or capable of being used for the taking of any fauna or for facilitating or assisting in the taking of any fauna (including, but without limit to the generality thereof, any prohibited gun, air gun, firearm, other gun of any description, catapult, or other weapon from which any shot, bullet, or other missile whatsoever can be discharged, and any trap, snare, net, boat, vehicle or other conveyance, animal, bird, decoy, poison, bird-lime, explosive, implement, gear, or apparatus, and any lamp, flashlight, torch, or other artificial light of any description, and any shot, bullet, cartridge, or other ammunition of any description): Where any appliance is carried or otherwise kept in parts by two or more persons in company, each and every one of those persons shall for the purposes of this Act be deemed to carry, or, as the case may be, otherwise keep the appliance.

"Bird"—Any bird wild by nature, whether native, migratory, or introduced: The term includes any such bird notwithstanding that it is in captivity or tamed, and any species and individual members of birds within the meaning of this definition, and also the whole or any part of the skin, feathers, carcass, eggs, nest, young and offspring of any bird.

"Mammal"—Any mammal wild by nature, whether native, migratory, or introduced: The term includes any such mammal notwithstanding that it is in captivity or tamed, and any species and individual members of mammals within the meaning of this definition, and also the whole or any part of the skin, carcass, eggs, nest, young, and offspring of any mammal: The term does not, however, include any marine mammals or any mice or any rats (other than water rats).

"Take"—Used in relation to any fauna, includes hunting, shooting, killing, poisoning, netting, snaring, spearing, trapping, catching, pursuing, disturbing, stupefying, disabling, taking, plucking, injuring, destroying, or damaging that fauna, or attempting, causing, or permitting or assisting in any of those acts: (Where a person is liable under this Act to punishment for taking any fauna and that taking is constituted by that person having done, or having attempted to do, or having caused or permitted to be done, or having assisted to do, in relation to that fauna, any of the acts hereinbefore specified in this definition, then it is immaterial that the fauna in question shall not have been taken into possession either by the offender or by any other person whomsoever).

For legislative purposes fauna have been divided into the following classes:—

(*a*) Permanently protected fauna.

(*b*) Protected fauna (during certain open seasons specified protected fauna may be taken).

(*c*) Pest fauna.

The Act clearly indicates that all fauna until legally taken or kept are the property of the Crown.

Marine mammals, mice, rats (other than water rats) and domestic cats gone wild are not subject to this legislation.

Administration

The Minister for Agriculture and Stock and certain officers of the Department of Agriculture and Stock are responsible primarily for administering the Act, and in addition other fauna officers and as many persons as deemed necessary for the conservation of fauna in any locality may be appointed as honorary protectors.

The credentials of a person desiring appointment as an honorary protector are important and accordingly it is necessary for each applicant to supply certain personal details and a suitable reference.

All members of the Police Force and persons occupying the following offices are, by virtue of their office, fauna officers.

(i.) Senior Adviser, Adviser, Assistant Adviser, Senior Inspector, District Inspector, or Inspector, in the Department of Agriculture and Stock, Queensland.

(ii.) Land Commissioner, Assistant Land Commissioner or Land Ranger in the Department of Public Lands, Queensland.

(iii.) Forest Officer under or for the purposes of *"The State Forests and National Parks Acts,* 1906 *to* 1948."

Fauna officers have right of entry to property and subsequent search. They may investigate and enquire, examine and seize and detain appliances and fauna, remove appliances and fauna, request names and addresses and verification thereof, stop any conveyance and request assistance from other appointed officers. Only members of the Police Force have power of arrest.

In respect of any person committing or suspected of committing an offence, an honorary protector may

(*a*) Require him to state his name and address.

(*b*) Require him to deliver up fauna or appliances.

(*c*) Take possession of fauna or appliances delivered up.

(*d*) Inspect licenses and permits.

(*e*) Request assistance from other appointed officers if necessary.

As far as honorary protectors are concerned, powers of interrogation only are provided. There is no provision for right of entry to property or for the primary seizure of fauna, weapons, etc., which may be received only if delivered up on demand.

It is an offence for any person to assault, obstruct, threaten, abuse, insult, or intimidate an officer or honorary protector when carrying out duties under the fauna legislation.

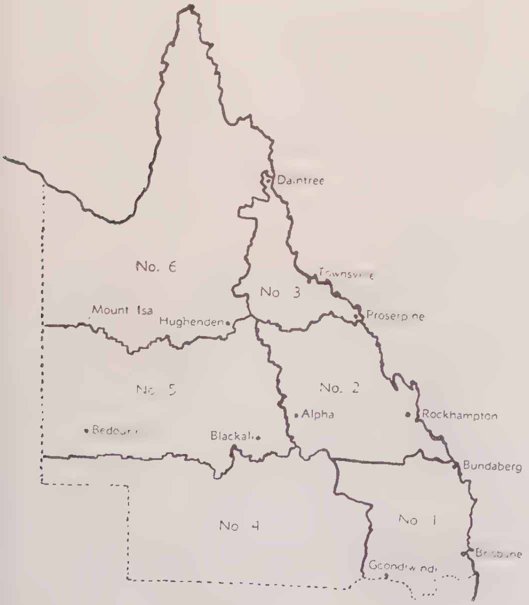

Plate 1

Sketch Map Showing the Approximate Boundaries of the Various Fauna Districts.

All kinds of fauna are not generally distributed throughout Queensland and therefore the State has been divided into six fauna districts (Plate 1). This allows conditions such as open seasons to be applied to a part or parts of the State without involving the whole.

Pest Fauna

Pest fauna includes species which are serious pests of the agricultural and pastoral industries. These can be destroyed throughout the State at any time of the year subject to restrictions relating to sanctuaries and some specified districts as listed below.

LIST OF PEST FAUNA

Birds

Wedge-tailed eagle.
Grey (white) goshawk.
Australian goshawk.
Collared sparrow-hawk.
Cormorants (shags).
Eastern swamphen (bald coot).
Falcons except the nankeen kestrel.
White cockatoo.
Silvereyes.
Crows and ravens.
Pied currawong.
Sparrow.
Starling.
Turtle dove.
Rose-breasted cockatoo (galah).
Bee eaters (Pest fauna only within the Brisbane and East Moreton Pest Destruction Board areas).

Mammals

Dingoes.
Rabbits.
Foxes.
Hares.
Flying foxes (Pest fauna only within the Brisbane and East Moreton and Toowoomba Pest Destruction Board areas).
Wild pigs.

Permanently Protected Fauna

The koala (Plate 2), platypus and echidna are permanently protected on account of their unique place in Australian and world fauna. Power to extend the list of permanently protected fauna is provided.

Plate 2

Koalas (Phascolarctos cinereus Goldfuss). Permanently protected fauna in Queensland.

Permanent protection means that animals so declared are protected in perpetuity and accordingly penalties in this part of the Act are higher than those provided for in other sections.

Protected Fauna

Although special provision is made for permanently protected fauna and pest fauna, all other fauna are deemed to be protected fauna, that is, fauna for which a close season exists throughout the whole year. It should be noted that for certain protected fauna an open season may be declared from time to time. It is an offence to take protected fauna.

Special permission may be granted for the taking of protected fauna that are causing serious damage or injury to any property, including crops or livestock, or are otherwise causing serious personal loss to the owner or occupier of any holding or are causing or likely to cause an injury to any person.

Special provision is made also for the taking of protected fauna likely to cause trouble on an aerodrome.

In all special permits issued, the general conditions under which fauna may be taken are specified; and the disposal of the fauna is subject to provisions that may be imposed.

Open Seasons

For commercial and sporting purposes the fauna outlined in the following table have fixed open seasons and any person in possession of an "open season fauna permit" may hunt or trap them during the periods indicated. An "open season fauna permit" is not required, however, to take wild duck or quail during an open season.

During open seasons "bag" limits may be imposed and the following table outlines the maximum number of fauna which any one person may have in possession during an open season, within the period specified.

Number	Name of Fauna	Period
15	Wild duck	24 hours
15	Quail	24 hours
2	Scrub turkey	24 hours

LIST OF OPEN SEASONS

BIRDS

Common Name	Open Season	District(s)
Black-throated finch Chestnut-breasted finch (bull finch) Diamond firetail (diamond sparrow) Banded finch (double-bar finch) Longtailed finch (grass finch) Masked finch Plum-headed finch Red-browed finch (redhead finch) Star finch (redfaced finch) Zebra finch	1st July to 30th September in each year inclusive	Nos. 1, 2, 3, 4, 5, and 6
All introduced birds including— Java sparrow Non-pareil finch Nutmeg finch Strawberry finch Goldfinch	1st January to 31st December in each year inclusive	Nos. 1, 2, 3, 4, 5, and 6
King parrot Rainbow lorikeet (Blue Mountain parrot) Red-winged parrot	1st May to 30th September in each year inclusive	Nos. 1, 2, 3, 4, 5, and 6
Rosellas (all species) Budgerigah or shell parrot	1st January to 31st December in each year inclusive	Nos. 1, 2, 3, 4, 5, and 6
Cockatiel (cockatoo parrot or quarrian)	1st May to 30th November in each year inclusive	Nos. 1, 2, 3, 4, 5, and 6
Brush or scrub turkey	1st June to 30th September in each year inclusive	Nos. 1, 2, 3, 4, 5, and 6
Grey duck (black duck) Maned goose (wood duck) Quail (all species) (NOTE.—In districts 1, 2, 3, an open season for wild duck and quail is declared from time to time by Order in Council)	1st January to 31st December in each year inclusive	Nos. 4, 5, and 6
Australian snipe Pin-tailed snipe Knot Great knot Sandpiper Stint Tattler Whimbrel	14th November in each year to 15th March in the following year inclusive	Nos. 1, 2, 3, 4, 5, and 6

MAMMALS

Common Name	Open Season	District(s)
Grey kangaroo Red kangaroo Eastern or dusky wallaroo North Queensland wallaroo Red-necked, scrub or eastern brush wallaby Black-striped wallaby Whiptail, grey-face or pretty face wallaby Black-tailed or swamp wallaby Sandy wallaby Red-legged pademelon Water rat	1st January to 31st December in each year inclusive	Nos. 1, 2, 3, 4, 5, and 6

Hunter's Licence

The following fees are payable for permits—

	£	s.	d.
Open season fauna permit (for personal use)	0	10	0
Open season fauna permit (taken for sale)	1	0	0

Unless specifically indicated, an open season fauna permit does not authorise entry by the permit holder onto any land the property of another. Additionally, although an open season may be declared, fauna may not be taken in a sanctuary.

Sanctuaries

Protection from molestation does not alone ensure the survival of some birds and animals. Hence the legislation makes provision for the creation of sanctuaries (that is, areas in which all birds and animals except declared pests are totally protected and free from interference at all times).

All islands that form part of the State of Queensland, all National Parks, State Forest Reserves, and many other areas and private properties have been declared sanctuaries. Sanctuary notices may be displayed and the unauthorised removal of these notices is an offence.

Within the boundaries of their properties, landholders and their authorised agents are permitted to take without restriction pest fauna within a sanctuary.

Persons may be ordered by authorised officers to leave a sanctuary and it is an offence not to quit a sanctuary when so ordered.

Prohibited Appliances

The use of cyanide and adhesive substances such as bird-lime is prohibited, and other poisons, materials and appliances may also be prohibited from time to time.

The use of flashlights or torches or other artificial light of any description is illegal, as also is the use of certain "prohibited guns" defined in the Act.

Dogs may be used only to take fauna during an open season.

Plate 3

Australian Bustard or Plain Turkey (Eupodotis australis Gray). A protected bird in Queensland. (Photo by courtesy of the Director of the Queensland Museum).

Fauna for Particular Purposes

For certain purposes, principally scientific and educational, the taking and keeping of fauna may be permitted. The conditions, provisions and restrictions under which a permit is granted are indicated on the permit. It is illegal to keep fauna in captivity unless authorised by the Act. It is not an offence, however, to keep open season fauna or fauna lawfully held prior to the inception of this Act.

A circular outlining the conditions and requirements relating to the construction of cages and enclosures in which it is proposed to display fauna for public exhibiton purposes is available.

Enclosures, cages and aviaries where fauna are confined whether privately, for public exhibition purposes, or for sale, must be kept clean and in a sanitary condition. Further, all captive fauna must be regularly fed and watered.

All aviaries containing 20 or more birds must be registered annually, and no fauna shall be sold or otherwise disposed of from premises, including enclosures, cages and aviaries, unless disposal is approved and until any necessary royalty due is paid.

Fauna and Skin Dealers

A person engaged in fauna or skin dealing is required to take out a licence and all premises must be registered. A permit, licence or certificate to deal in fauna or skins does not authorise the holder of such to take fauna. Permanently protected fauna cannot be handled by fauna or skin dealers.

Plate 4

Minnamoolka Waterfowl Sanctuary, via Mount Garnet, North Queensland.

Licence fees payable by fauna and skin dealers are as follows:—

	£	s.	d.
Fauna dealer	2	0	0
Skin dealer	10	0	0

Fauna may be removed only by permit within Queensland. It is also provided that fauna shall not be exported to another State unless an export permit has been obtained and an import permit granted by the proper authority in the place outside Queensland to which the fauna are being introduced.

All crates, bags or bales containing skins must be branded with identifying marks.

The introduction of fauna not found naturally in this State is subject to special permission. This clause guards against the introduction and liberation of noxious fauna.

The sale of permanently protected fauna is prohibited although the sale of protected fauna (including open season fauna) legally taken and held may be permitted.

Royalty

Royalty at the prescribed rates is chargeable on all fauna taken in Queensland. The rates for open season fauna are outlined below.

OPEN SEASON BIRDS	s.	d.
Black-throated finch	0	6
Chestnut-breasted finch	0	1
Diamond firetail	0	3
Banded finch	0	1
Longtailed finch	0	6
Masked finch	0	6
Plum-headed finch	0	1
Red-browed finch	0	1
Star finch	1	0
Zebra finch	0	1
All introduced aviary birds except—	Nil.	
Java sparrow	0	3
Non-pareil finch	0	3
Nun finch	0	3
Nutmeg finch	0	3
Strawberry finch	0	3
Goldfinch	0	3
Budgerigah or shell parrot	0	3
King parrot	1	0
Rainbow lorikeet (Blue Mountain parrot)	2	0
Red-winged parrot	2	0
Rosellas	0	3
Cockatiel (cockatoo parrot or quarrian)	0	3
Brush or scrub turkey	No royalty payable during open season. General rate of 5s. per bird to be paid when taken under special permit during close season.	
Wild duck and quail		
Snipe		
Sandpiper		
Stint		
Tattler		
Whimbrel		
Knot		

OPEN SEASON MAMMALS	s.	d.
†Grey kangaroo	0	6
Red kangaroo	0	6
Eastern or dusky wallaroo	0	3
North Queensland wallaroo	0	3
Red-necked scrub, or eastern brush, wallaby	0	3
Black-striped wallaby	0	3
Whiptail, greyface, or pretty face wallaby	0	6
Black-tailed or swamp wallaby	0	3
Sandy wallaby	0	3
Red-legged pademelon	0	3
Water-rat	0	1

The person who takes the fauna, the fauna dealer and the skin dealer are liable jointly or severally for the payment of royalty, provided that royalty shall not be paid more than once upon any fauna. Power is given for dealers to deduct royalty from monies held as a result of the sale of fauna. It is an offence not to pay royalty and provision is made for the recovery of unpaid royalty. Fauna, including skins, may be seized if royalty is unpaid.

General

It is obligatory for holders of authorities issued under the Act to abide by any conditions contained therein and such authorities must be carried when engaging in the business allowed in the permit.

For humane reasons all traps must be inspected at intervals of not more than 36 hours.

A person in possession of fauna can be required to supply proof that the particular fauna was taken or is kept lawfully under the Act.

The forging of permits and similar actions which may be used to circumvent the true purposes of the Act constitute offences for which a heavy penalty is provided.

Fauna, weapons or other things seized may be detained for a period of twelve months unless it is established at an earlier date that no offence has been committed. Upon conviction for an offence all weapons or fauna seized are automatically forfeited to the Crown.

Unless expressly provided, right of entry to land is not granted by the issuance of any permit. The owner or occupier of land may demand the name and address of any person trespassing upon a holding and may require the trespasser to quit the holding. It is an offence to remain on the holding if ordered to leave.

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† Royalty on grey and red kangaroos has been suspended from 1st April, 1960, to 31st March, 1961.

orchard and garden

Tomato Mosaic.—Mosaic is still one of the most important diseases of tomatoes in Queensland. The reason for this is that many growers fail to understand just how the trouble is spread about the farm.

Mosaic is a virus disease and is highly contagious. During every operation in the establishment of new tomato plantings, this fact should be remembered. Handle young tomato plants as little as possible, and always wash the hands first with plenty of soap or detergent.

The virus is carried over from one crop to the next in the soil, or on posts and trellis wires and implements used for cultivation.

Experiments have shown that a 10 per cent. solution of tri-sodium phosphate (that is, 1 lb. to 1 gal. of water) is most effective in destroying the mosaic virus. It is therefore suggested that this preparation be applied with a knapsack sprayer to old tomato wires, posts, and implements for this purpose and, of course, the rule of no smoking around young tomato plants still stands.

—*J. C. JOHNSON,*
Plant Pathologist.

Raising Seedlings in the North.—The raising of seedling plants for the early vegetable or flower crop can present a serious problem in districts with high summer rainfall such as that experienced in North Queensland. The best method is to use seed trays or boxes that can be readily moved under cover or into the sunlight or shade as weather conditions and the state of growth of the plants indicates.

Flat plum or grape cases make suitable seed trays as they are large enough to hold a reasonable number of plants but not too heavy when filled to move about. If the boxes have been used before, it is wise to avoid risk of disease contamination by spraying or brushing them with a 2 per cent. solution of formalin in water. Leave them to air out a few days after treatment.

When filling the seed trays, don't forget a layer of cinders or gravel to provide drainage in the bottom of the boxes. And stand the boxes off the ground on a couple of pieces of timber so they can drain freely. If they are placed directly on the ground the cracks between boards that should allow drainage quickly becomes clogged with soil.

Seeding loam should not be too heavy or it cakes and retards root development. When dry it absorbs water with difficulty, and when wet it often becomes waterlogged and drowns the roots of the seedlings. If on the other hand, the loam is too light and sandy it dries out too rapidly and will not hold to the roots when transplanting the plants. A good seeding loam is a mixture of loamy soil, sharp sand and well-rotted leaf mould or manure that has a spongy texture when moistened.

For early seedlings some time can be saved by avoiding the set back that transplanting always gives a plant. To do this the seed box should be packed with small cardboard or tarred paper cylinders which are filled with the seeding loam and then have a couple of seeds sown in each. These tubes are made from sheets of card about 6 in. by 4 in. rolled and fastened with paper clips, string or rubber bands to make cylinders 4 in. high and about 1½ in. in diameter. When transplanting seedlings grown in this fashion, the tube containing a growing seedling is lifted from the box, the fastening is taken off and the paper peeled away without disturbing the soil. Then the plant in its undisturbed cylinder of soil is set out in the field row and will go straight ahead without any check.

—*F. W. BUTCHER,*
Horticulture Branch.

Children Learn to Pack Fruit.—The Agriculture Department gave instruction in fruit packing to nearly 600 school children in three of Queensland's main fruit-growing districts last year. The boys and girls were taught the correct methods of packing apples, tomatoes and oranges for sale.

Correct packing increases growers' returns. Good packing improves the market appearance of fruit and reduces wastage. Instruction of school children had been operating for some years with the full co-operation of the Education Department, and was raising the standard of packing and presentation of Queensland fruit and vegetables.

Children who received fruit packing instruction last year were drawn from 30 State schools. On the Granite Belt, apple packing classes were held at 14 schools in May and June. Classes in tomato packing were held in nine schools in the Cleveland-Redland Bay area during July and August. At the same time, orange packing classes were held in four Maroochy district schools. At each school, the children were given an hour's instruction a week for six weeks.

A special advanced class in tomato packing was held at the Victoria Point, Redland Bay and Thornlands schools. In these, the 61 advanced students were given one hour's instruction a week for four weeks.

In all, 239 children were given lessons in apple packing, 263 (including the 61 advanced students) in tomato packing and 72 in orange packing. Classes were conducted by Agriculture Department officers in association with the Education Department.

All the children were keenly interested in the course, and the standard of packing was particularly high. There was keen competition among the schools for prizes awarded at the Stanthorpe, Cleveland and Nambour agricultural shows.

—*S. A. TROUT, Director of Horticulture.*

Early Planting for Strawberries.—Several years' research work on time of planting for strawberries has given precise information for southern Queensland. It has shown that late planting will inevitably result in poor plant performance and lowered yields.

In trials at the Redlands Experiment Station, plantings of the Phenomenal variety extended from mid-February until late April. The plots received normal fertilizer treatment and were mulched with 1 in. of tanbark. Harvesting extended from May 9 to December 11.

Reporting on the work, Mr. J. C. Elich, Assistant Experimentalist, said that the time of planting influenced plant growth, flower production and total yield. Early plantings (mid-February and early March) produced large, vigorous plants in which flowering commenced about 13 weeks, and fruit harvesting 19 to 20 weeks after planting.

Mid-season plantings (the second and third weeks of March) and late plantings (late March to late April) produced their first mature fruit only nine weeks after establishment. However, this rapid fruiting is of no great importance, for only a very small proportion of the crop was produced before the end of June.

In July, all plantings showed a big increase in production, but late-planted crops produced only half as much fruit as the earlier plantings. This yield pattern continued through August, with the late plantings falling still further behind. All crops reached a peak of production in the first half of September. A steep falling off occurred in October, followed by a substantial rise in November by the early plantings. Late plantings did not show this rise.

It is clear that late-planted crops do not produce vigorous, productive plants, and consequently, their yield is greatly depressed. Early plantings produced 77 per cent. more fruit than the late.

From these experiments, it is evident that strawberry runners should not be planted after the third week in March. It is far more profitable to err on the side of earliness than lateness. But nothing is gained by planting earlier than the fourth week of February. So, the best planting time is between February 21 and March 20.

—*K. M. WARD,*
Senior Horticulturist.

Altering Shoulder Seams.—Few women who buy ready-made dresses are fortunate enough to find one that fits perfectly.

From experience and "shopping around," most women find a store, or a make, supplying a garment requiring only a minor alteration to make the dress fit correctly.

Adjustments to the total length, to bodice or sleeve length, to waist or shoulder are some of the alterations which, *if minor,* can be made without altering the basic line of the whole frock.

One of the faults in ready-made dresses may be a too-long shoulder line which is uncomfortable, in addition to spoiling the hang and fit of the bodice and the sleeve.

A too-long shoulder seam gives a droopy appearance which is not smart.

It would not be wise to attempt to shorten a shoulder seam by more than one inch. Much more than that could affect the hang of the sleeve to the point where loss of smartness from drooping shoulder lines would be replaced by loss of smartness from badly hanging sleeves.

Alterations may be made thus:—

Carefully unpick the shoulder seam.

Take up a dart on the back shoulder on the neckline side of the centre of the shoulder seam.

Taper the dart off to nothing at an average of about 3 in. in length. Be careful not to change the width of the blouse back.

Shorten the front shoulder not more than half an inch by making a dart if there is not one there already. If there is one it is better to make a second one-half to three-quarters of an inch away.

If the style and/or fabric are suitable, gathers or tucks may be used to take out the unwanted length of the shoulder seam.

If there is a collar the dart may be placed to come under it.

If the front shoulder is still longer than the back when restitched unpick the front armhole to about 5 in. below the shoulder seam. Trim the extra from the armhole by starting from nothing at this point to the shoulder seam.

If the shoulder seam was taped be sure to cut the tape to the correct length and restitch to shoulder seam.

Roasting Poultry.—Those who have tried cooking poultry in aluminium foil will be interested to compare their opinions and results with those of the British Good Housekeeping Institute.

The Institute conducted a test to find out which method of roasting poultry—conventional uncovered or in aluminium foil—was preferable.

Here are the results of this test where two birds of the same weight were seasoned and placed on the same shelf in two similar dishes; with a cooking time of 20 minutes to the pound.

At end of one hour forty minutes:—

Open method—cooked; good attractive brown appearance.

Foil method—further cooking needed; very slight, pale-brown colour.

The bird in the foil was given another twenty minutes cooking with the foil left open and turned back. Comparisons were then made.

The general appearance and colour of bird cooked by open method was very good, with a crisp skin. The bird cooked in foil also had a good general appearance and colour, but the skin was not as crisp and attractive as on the other bird.

A difference of 3¼ oz. loss in weight in favour of the foil method.

While hot both white and dark meat of bird in foil had more flavour and was moister: the bird cooked by open method had a good flavour, the breast was drier and crumbly but the skin tasted better.

When cold there was not such a noticeable difference in flavour between dark meats, but meat cooked by the foil method was moister. The breast, foil method, definitely had more flavour and was moister.

Selection of cooking method is very much a matter of personal taste and preference governed by moistness and texture of flesh. Oven is cleaner when foil method is used, as the small amount of juices is collected in the foil.

Cooking time for foil method twenty-five minutes to the pound.

Better Broom Cupboards.—Cleaning equipment and supplies are not the easiest items to store, and too often provision of such storage is inadequate—or even not provided.

The main things to keep in mind when planning this particular storage are, "where" and "how much."

Again the golden rule for any storage—store where *first* needed—should be the guide.

A central location for what is usually referred to as a broom cupboard is most convenient for the storage of cleaning tools used in all parts of the house.

In addition to this central storage, what may be termed "local" or "on the spot" or "where wanted" storage should be provided in the bathroom, at the sink, and in the laundry for materials wanted there.

The fact that this will result in duplication of some equipment and supplies is immaterial—the convenience of, say, a jar of cleanser in each of three places outweighs the initial "treble" purchase price.

The fault with most broom cupboards is that they are not large enough and/or not designed for the tools and supplies to be kept there.

In general, this type of cupboard consists of hanging space below a shelf which is usually too high to be able to use more than the front few inches, providing you can reach it anyway.

Far better is a set of shallow shelves on one side or the back of the cupboard. An added advantage of getting rid of the shelf from the top is that items can be hung high enough to clear the floor and leave it free for standing equipment.

The following suggestions may act as a guide for more efficient storage space:

Make a list of all items to be kept in the one place.

Assemble these items, and measure and plan space to fit sizes and shapes.

Clearance depends on the size and weight of the equipment. Allow one or two inches beween pieces of equipment and two inches above and below tools which hang on the wall.

A depth of 16 to 20 inches takes care of modern equipment and eliminates reaching and the need for putting one piece of equipment in front of another.

A sturdy door will allow adjustable holders, hooks, to be attached to it, as well as to the walls, for hanging brooms, mops, brushes.

Doors should open easily and be wide enough for equipment to be easily seen and removed.

Adjustable shelves in the centre back of the cupboard provide easily accessible space for supplies.

Rounded corners and smooth washable finishes are desirable.

Provide good ventilation.

Allow ample height in one section for brooms and mops.

Keep vacuum cleaner and attachments together.

Place vacuum cleaner so it is easy to slide out and slip back in.

Keep instruction books for tools, also cleaning hints, handy.

History-Making Wool

Australian tennis player, Miss Jan Lehane, showing one of the "Sironized" woollen tennis frocks which she will wear at the Wimbledon Championships. The wardrobe of Miss Lehane, her chaperone and her partner, will feature these wash-non-shrink tennis frocks of lightweight wool, with gold kid belts.

Australian-made fine wool "Sironized" fabric made history as the first Australian-made wool fabric to be shown at the Royal Command parade by London's Top Ten, held at Osterley Park in the presence of the Queen Mother and Princess Margaret. The frock and jacket in Prince of Wales miniature check was designed by WORTH and is worn in this picture by Australian model June Massey.

A simple lock placed high may keep children's fingers out; but cleaning agents which are poisonous should be kept well out of children's reach.

Keep cupboard well organised and tools and supplies easily accessible.

Kitchen Floor Coverings.—Realising that recent advances in the manufacture of floors and floor coverings have made it increasingly difficult for householders to decide which type of floor treatment will answer their needs best, two organisations in Great Britain have been carrying out investigations.

The two organisations concerned are the Council for Scientific Management in the Home, and the Consumers Association Limited.

The investigation was conducted in two parts, namely: finding out, mainly from manufacturers, what was available; while the second took the form of a questionnaire sent to a group of housewives, and to local housing authorities.

Housewives' Preference

Two hundred and seventeen English housewives listed the desired qualities of a kitchen floor covering in what they considered the proper order of importance.

The rating was as follows:—

It should—

- be easy to clean.
- be durable, that is, retain its original appearance for a considerable period of time.
- not be slippery when wet.
- be resistant to water, oil, heat, abrasion, dusting, chipping, cracking, and denting.
- have a bright, cheerful appearance.
- not feel too cold.
- not be noisy.
- be reasonably resilient.

The report of these investigations goes on to state that the ideal kitchen floor covering, possessing all desired qualities, has yet to be made. The housewife, therefore, has to decide on the qualities she considers of most importance, and choose flooring accordingly.

In addition to cost, other factors which will also influence her choice will be the number and ages of the family group, whether she lives in the country or the city, a house or a flat.

Books Are Valuable.—Most people can still make time to read and, as time passes, gather a library of good friends; perhaps on a single shelf, perhaps in a number of bookcases. But sometimes their accommodation is a problem.

It is good to see that book storage is frequently included as a necessity in the furnishing of homes today. The wide range of packet unit furniture—which can be home assembled—makes it easy for such parts of a home as corners and closed-up doorways to be used for book storage.

Opinions differ regarding closed or open shelves. Those who feel that books should be as accessible as possible prefer open shelving, and so have more dusting to do to preserve their treasures. Probably the best solution is to provide some open and some closed storage.

The positioning of a bookcase or a shelf in a room is important. Those points which must be checked include:

The ease with which books can be taken from the shelves. This is influenced by the height of the shelf, the placing of other furniture, and the free swing of doors—if a thing is hard to get at it is not used so often.

Books should be stored where they will be wanted, for example, keeping recipe books anywhere but in the kitchen doesn't make sense.

In almost every home a place for books is needed in every room. (Magazine racks have been suggested for bathrooms!)

Protection from direct sunlight to prevent bindings fading, but still with enough light (day and night) to make it easy to select a book.

In addition to the necessary regular dusting, books should be removed from the shelf once a year and each one gone over thoroughly with a vacuum cleaner or a clean cloth. (If kept on open shelves more frequent attention is desirable.)

Valuable leather-bound books are improved by rubbing lightly with white shoe cream.

Protection for the many good paper-bound books which form a large part of today's collection may be provided by special covers or holders. Most stationers carry a range from which suitable covers may be selected, in some cases large enough to take a collection on a topic, or the twelve monthly issues of a year. Those who make a hobby of bookbinding can always have their covers tailored to measure and coloured to taste.

—*New South Wales Department of Agriculture's "Press Notes."*

More About Grain Fattening Of Beef Cattle

By J. ARBUCKLE, Senior Adviser in Cattle Husbandry

During the 1959 season on the Darling Downs, greater use was made of grain—usually grain sorghum—in fattening beef cattle. Feed-lot fattening extended, and grain was used to supplement light crops in the crop fattening areas. This article summarises the results and comments on the efficiency of grain feeding.

In physical terms the efficiency of grain usage in beef production depends on the ratio of grain consumed to beef produced. Under feed-lot conditions, the liveweight can be reasonably predicted for a particular class of animal on a ration of grain and lucerne hay.

Other factors which determine how profitable such an enterprise will be are variable. Last season they were in favour of the use of grain for fattening. These variable factors are:

- The price of grain.
- The cost of suitable stock and the value of the finished product.
- The size and fattening ability of the stock.
- The extra cost involved in labour and facilities for feeding grain to stock.

Also a supply of suitable stock is necessary and the finished product must fulfil market requirements.

Grain Prices

The ex-farm return to growers for grain sorghum sold as grain at the end of the 1959 winter was comparatively low. While factors such as distance to rail head, the cost of freight to ports and storage cost on the property affected prices on different properties, the value of grain sorghum on the property was generally between £7 and £10 a ton.

Cost of Suitable Stock

Suitable stock are those which are capable of high weight gains with a comparatively low maintenance requirement and producing a carcass which commands a premium price. Normally store cattle can be purchased at a rate per 100 lb. carcass beef which is lower than that obtained for the fat animal. Thus the fattener is able to obtain a return from two sources. One is the value of the meat produced by the animal during fattening and the second is the increased price per 100 lb. carcass obtained for the meat on the store animal at the time of purchase.

Owing to the heavy demand for a leaner type of carcass, the price per 100 lb. carcass of store and forward store stock increased considerably. In some cases the point was reached where there was little or no difference between the meat price per 100 lb. of store and fat cattle. Under these circumstances more attention was paid to weaner and yearling stock. When in a condition for slaughter, these types of animals are somewhat lighter than the most popular type of carcass. However, the demand for beef was so strong that all animals fit for slaughter found a ready and lucrative market. This situation may not recur and in any major expansion fatteners may have to obtain stock which will produce a carcass at a weight of 400 to 580 lb. Such carcasses attract buyers from many sources and would be less subject ot fluctuation in the event of uncertainty in the beef market.

The producer who is able to breed his own supply of store cattle for fattening is in a secure position since he can adjust his activities according to market developments and requirements. Should he be able to produce grain and lucerne hay in addition, he is then in the happy position of being able to adapt his production according to the most favourable avenue available at the time.

Size and Fattening Ability

The size of an animal is important in determining the productive efficiency of grain. A small animal costs less for maintenance (which can be looked on as an overhead cost) and although its rate of gain may be lower than for a larger animal the ratio of feed used for production to feed used for maintenance favours the smaller animal. (When using the word "small" in this respect it is assumed that the animal is smaller because it is younger and not because of stunting or deformity).

The economy of the younger animal is illustrated in the following table which shows the cost of producing beef on animals of different sizes. The table is based on a feed cost of £10 a ton for grain and hay and weight gains as stated. No allowance has been made for expenses other than feed costs.

TABLE 1

FEED COST OF FATTENING IN RELATION TO LIVE BODY WEIGHT

Liveweight	Expected Gain/ Animal/Day	Maintenance Cost/ Animal/Day	Total Cost/ Lb. Gain	Cost/100 Lb. Estimated Carcass Weight
Lb.	Lb.	*d.*	*d.*	£ *s.* *d.*
400 ..	2·2	6	5·5	4 11 8
500 ..	2·4	6·7	6·25	5 4 2
600 ..	2·6	7·7	7·0	5 16 8
700 ..	2·8	8·7	7·5	6 5 0
800 ..	3·0	9·6	8·0	6 13 4
900 ..	3·2	10·6	8·5	7 1 8

The maintenance cost of the 400 lb. animal is about two-thirds that of an 800 lb. beast while the cost for each pound weight gain of the 400 lb. animal is about three-quarters that of the 800 lb. animal.

Additional Costs

Extra costs associated with feed-lot fattening are those for labour, machinery for feed preparation, buildings, water supply, together with running costs, and interest on capital and depreciation.

Since those producers concerned with feed-lot fattening on the Darling Downs last season had adapted existing facilities and used existing machinery and labour, the additional costs are not readily calculated but would be quite low. In fact, the greater use of machinery and buildings has the effect of lowering the overhead charges on these items. More efficient use has been made of labour, in some cases.

Feed-lot fattening to date has been in the nature of a sideline activity and economies could be effected in labour for feed preparation and feeding out should conditons justify its becoming a full-scale activity.

To date, the general procedure has been to process the grain and hay through a hammer-mill, place it in bag butts and take these butts to the troughs located in the centre of the yard. The following figures are quoted as an example of time and labour involved:

At the beginning of a project one operator used 3 men for 6 hours once weekly to mill the weekly ration for 50 head. By some re-organisation an adjustment of hay bale size to suit the mill, the labour requirement was reduced to 2 men who required 3 hours to prepare a similar quantity of feed. If the feed is conveniently prepared in bag butts it is generally accepted that one man can feed 50 head in half an hour. Such feeding is necessary twice daily.

Feed-Lot Results

By means of a mobile weighbridge it has been possible to measure the weight gain of animals in feed lots. The following information was obtained from a group of Hereford weaners in the Warwick district. The group contained 24 steers and 21 heifers and both sexes gained weight at an equal rate. They were fed for 94 days. Feeding started on July 8 and the stock were turned off on October 16, 1959.

TABLE 2

PERFORMANCE OF 45 HEAD OF STOCK IN A FEED LOT

	8–7–59	16–10–59	Gain
Average liveweight ..	423 lb.	642 lb.	219 lb.
Average estimated dressed weight	212 lb.	340 lb.	128 lb.
Average daily liveweight Gain	2·3 lb.		
Sale value at £11 per 100 lb. carcass	£37 8s. per head		
Value at 8–7–59 at £10 per 100 lb. carcass	£21 4s. per head		
Increase in value during feeding period	£16 4s.		
Feed cost	Lucerne hay £13 ton on property Grain sorghum valued at £10 10s. a ton		
Total feed consumption ..	29,684 lb. licerne hay 41,298 lb. Sorghum grain		
Average ration for each animal daily	7 lb. hay 9.8 lb. grain		
Cost of ration for each animal daily	19s. 7d.		
Total cost of feed	£348		
Feed cost per animal for 94 days	£7 15s.		
Difference between increased value of animal and cost of feed	£8 9s. per head		
Cost per 100 lb. liveweight gain	£3 10s. 6d.		
Cost per 100 lb. estimated carcass gain	£6 1s.		
Average requirement for 1 lb. liveweight gain	3 lb. lucerne hay 4·2 lb. grain		
Average requirement for 1 lb. carcass gain ..	5·1 lb. lucerne hay 7·2 lb. grain		

The following table gives average figures from three groups of yearling Herefords at different centres. Figures are averages of 83 head which were fed a ration consisting of two parts of milled grain to one part of milled lucerne hay.

TABLE 3

AVERAGE FEED CONSUMPTION AND RATE OF GAIN

No. of days	98
Rate of gain	2·47 lb. daily
Weight at commencement	609 lb.
Weight at turn-off ..	851 lb.
Feed consumption per head daily	13·0 lb. grain 6·5 lb. lucerne hay
Feed consumption—	
(*a*) lb. liveweight gain	5·2 lb. grain 2·6 lb. hay
(*b*) lb. estimated carcass gain	8·6 lb. grain 4·3 lb. hay

From the information obtained on rate of gain of the animals referred to in Table 3 the following guide to feed cost per 100 lb. carcass gain has been derived. It is applicable when the ration consists of two parts grain and one part lucerne hay. (This ratio of grain to hay can be varied in practice, but a variation would probably affect the rate of gain.)

TABLE 4

FEED COST OF PRODUCING 100 LB CARCASS BEEF AT VARYING FEED PRICES

(*Shillings*)

Grain Cost Per Ton	Lucerne Hay Cost Per Ton			
	£5	£10	£15	£20
£ 5	58s.	77s.	96s.	115s.
£10	96s.	115s.	135s.	154s.
£15	135s.	154s.	174s.	193s.
£20	174s.	193s.	212s.	231s.

Thus if grain and hay are both £10 a ton, the cost is 115s. per 100 lb. carcass. An increase to £15 a ton in the price of grain increases the cost to 154s. per 100 lb. if lucerne remains at £10.

For intermediate figures for lucerne hay, increase the cost per 100 lb. carcass by about 4s. for every £1 increase in the price of hay. Thus with grain at £10 a ton and hay £12 a ton, the cost is 115s. + (4s. × 2) = 123s.

In the case of intermediate figures for grain, the cost per 100 lb. carcass is increased by nearly 8s. for every £1 increase in grain price.

It is pointed out that Table 4 does not take into account any difference in price per 100 lb. between the store and the fat animal.

Weaners

The growth rate of a group of weaner calves in a feed-lot has also been measured.

A producer bought 49 head of backward calves in the Dalby saleyards for an average price of £15 a head.

Average price per head on 26–5–59	£15
Average price per head on 15–9–59	£31
Difference (increase in value) ..	£16
Total grain eaten per head ..	908 lb.
Total hay eaten per head ..	454 lb.
Cost of feed per head at £10 ton	£ 6
Increase in value less feed costs	£10 per head

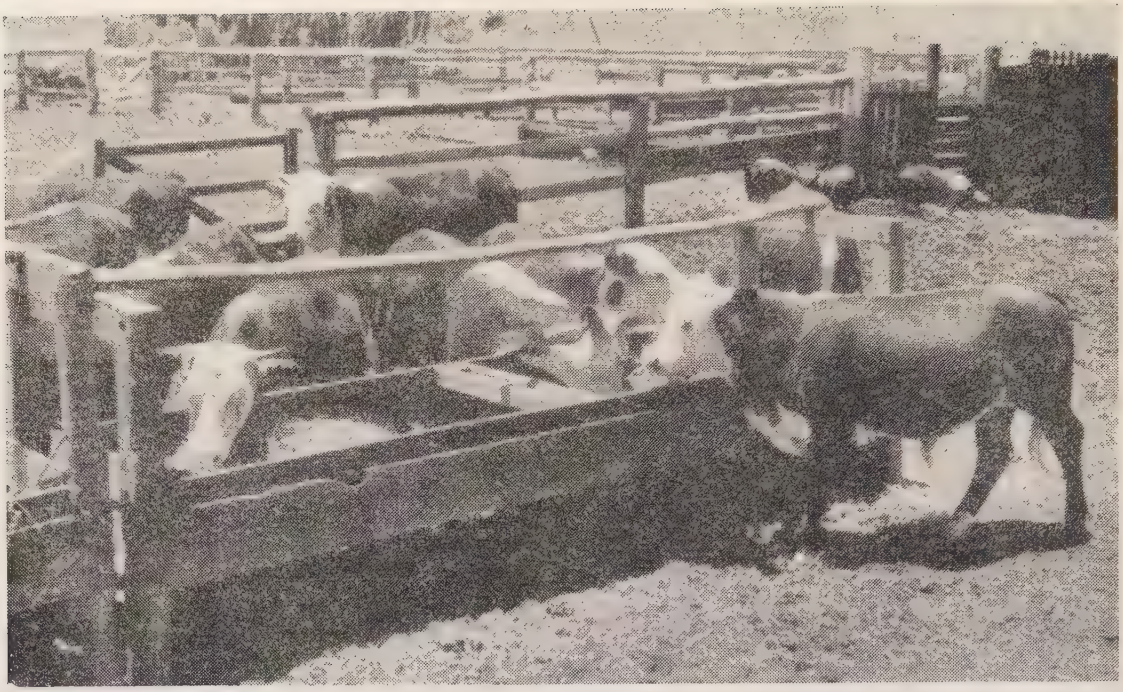

Plate 1

Existing Yards were Turned into a Temporary Feed Lot. Note the use of pigs which lived on grain not digested by the stock.

From this, overhead expenses have to be deducted.

Another way to approach the costing of this venture is to value the beef put on at the market rates ruling at time of sale. This method partly cancels any influence of unpredictable market changes.

Liveweight of calves on 26-5-59	332 lb.
Liveweight of calves on 15-9-59	556 lb.
Liveweight gain	224 lb.

It is estimated 67 per cent. of this gain would be carcass weight, giving a carcass gain of 150 lb.

Average price per 100 lb. dressed weight of calves was £11 5s.

Therefore—

	£	*s.*	*d.*
Value of beef gained	16	17	6
Less feed cost	6	0	0
Gain per head	£10	17	6

This figure compares with a profit of £10 head which was the difference between the actu cost of steers and the sale price.

Other Uses for Grain

Apart from the feed lot, other uses of grai for beef production were found last season.

Fattening of cattle on winter crop is now feature of beef production on the Darling Downs In previous years the practice has been to fatte two and three year old steers. In addition, a goo deal of attention was paid last season to veale production. With both classes of animals th producer is in the position of having to predic crop productivity if he is to approach the bes utilisation of it. In 1959, the lack of rain in lat winter resulted in a very poor regrowth followin the first grazing. Consequently, some fattener were in the situation of having unfinished stoc and not enough crop in the paddock to top ther off.

Crop and Grain

At least two men took the step of putting out ground grain sorghum in troughs in the crop paddock. The stock were given free access to the grain and although there are elements of danger in this practice no trouble occurred because of bloating and there was only one case of founder.

It was found that the stock regulated their consumption to about 10 lb. of grain daily. This reduced the grazing pressure on the oat crop and the combination of grain and crop resulted in the topping-off of the full quota of animals.

The addition of some form of roughage to the grain would make this practice considerably safer. While the efficiency of grain utilisation is comparatively low under these conditions, the feeding of it enabled the producers to adhere to their operational programme and the labour cost was very low. They were able to sell on a high priced market and the cash is available for purposes of re-stocking when required.

Silage and Grain

Other producers who normally crop-fatten had a supply of sorghum silage on hand. Two of these found themselves with unfinished steers and their crops eaten out. They were able to utilise the silage and grain to finish the cattle. The daily ration fed was about 80 lb. of sorghum silage and 11–13 lb. of grain per animal. Fattening the stock in this manner avoided the alternative of turning the steers out to grass with subsequent loss of condition. They would not have been ready for turn-off until next season.

Should the 1959 relationship continue between the price of grain and the price of beef we can expect to see an expansion of the use of grain for beef production. A supply of grain plus some roughage provides a measure of security to the crop-fattener, enabling him to operate with greater confidence.

Plate 2

The Troughs Used were Simple, Home-Made Structures. Well-drained yards are needed for the feed-lot.

Plate 1: **The Best Calf Bails Have a Concrete Floor and a Roof.**

Calf Rearing

By A. HUTCHINGS, Senior Adviser in Cattle Husbandry.

This article sets out several feeding systems for young calves and deals with the care and management of heifers to the time of mating.

On an average, 10 calves are required each year to replace wastage in a herd of 50 dairy cows. In general, it is preferable to select and rear them on the property in order to avoid the risk of introducing disease into the herd. Further, a particular line of breeding can be followed, if desired. Finally, the production background of the heifers will be known if they are bred on the farm.

Only healthy calves should be retained for rearing. They should be selected from cows with good production and the desirable dairy characteristics of good temperament and milking habits, thrift and freedom from chronic disease.

Calf Nutrition

For growth, the young dairy animal requires proteins, carbohydrates, fats, minerals, vitamins and water. Collectively, the calculated total energy value of these constituents in feeds is expressed in terms of Total Digestible Nutrients. The terms "Food Units" and "Starch Equivalent" are used in European countries to express the energy value of a foodstuff.

The Total Digestible Nutrients (T.D.N.) value is taken as a measure of the energy value of a food. Energy is required for maintenance of health, growth and all normal functions. It is used in the processes of digestion, in grazing, walking and galloping around, in maintaining normal body temperature and breathing. Energy obtained beyond these requirements is stored as fat, and muscle when protein is available, and is reflected in increased weight of the animal.

Proteins.—Proteins are substances containing itrogen and are made up of a number of simpler ubstances called amino acids. Not all amino acids are present in any one form of protein and for this reason it is desirable that the young growing calf be supplied with protein of both animal and plant origin.

In calves, protein is used in building lean neat and muscle, internal organs, connective issue and parts such as skin and hair. It is an ssential part of the cells which multiply as growth occurs. Thus a sufficient quantity of good quality protein is required for growth of young animals.

Minerals.—A recommended diet will normally ontain sufficient of the minerals required by oung calves. However, the addition of salt is ften beneficial in concentrate mixtures and the ddition of lime and phosphate is recommended where meals form a high proportion of the total iet of young calves. Either a lack, or a gross mbalance, of lime and phosphate will interfere with normal bone development and may result n rickets.

Vitamins.—Of the several vitamins necessary or health only vitamin A needs special consideration. At birth, calves have very little eserve of vitamin A in their bodies. It is proided in the colostrum which they must have. Vitamin A is important in growth and health. t helps to protect the body, particularly the espiratory and digestive tracts, against the entry f disease organisms. Green feeds are rich in itamin A. Fish oils are the normal source of upplementary vitamin A and can be used in the ation, if necessary.

Water.—Water forms a large portion of many rgans of the body, and is necessary in the igestion and transporting of food materials, in olution, to and from the various parts of the ody. It also influences the control of body emperature.

The amount of water required increases as ilk allowance is reduced. As with most nimals, calves will drink several times during ot days. Insufficient or impure water supply educes the appetite, with consequent loss of condition. So clean cool water should always be available to calves, even when they are getting milk or succulent pasture.

The Stages of Calf Feeding

The process of calf feeding can be divided conveniently according to age and development of the digestive system. Although development is continuous it is convenient to consider separately three main stages. They are:

From birth to one month.

From one month to three months.

From three months onwards.

From Birth to One Month.—There are four compartments in the ruminant stomach. They are the rumen or paunch, the reticulum or honeycomb, the omasum or bible, and the abomasum, true stomach or fourth stomach.

Digestive juices are secreted only in the fourth stomach which digests food in a similar manner to that of single-stomached animals such as pigs and humans. In the first four weeks of life only the fourth stomach functions to any extent. For this reason the very young calf cannot digest roughage feeds. Furthermore, the digestive juices can only properly digest milk or milk products. Other foods are unsuitable and may, indeed often do, cause digestive upsets if fed to calves less than a month old.

The newly-born calf should be fed milk proportionate to its weight. Overfeeding must be avoided. In fact, the daily allowance should be restricted to 10 or 12 per cent. of body weight and when wholemilk is terminated before a month of age the reconstituted milk may be reduced to as low as 9 per cent. of body weight; reconstituted milk may cause digestive upsets if fed too liberally.

Temperature of the milk is important and during the first fortnight, at least, it should be fed regularly at near blood heat. Cooler milk may be fed from then on provided it is fed regularly at the same temperature.

Strict attention to details of feeding and hygiene are necessary at all times. All changes in feed must be made gradually, the complete change taking about two weeks.

The first milk after calving is known as colostrum or beastings. Colostrum is particularly rich in antibodies (substances which assist the calf to resist certain diseases) and contains up to 70 times the vitamin content and four times the protein content of ordinary milk.

The antibodies can only be fully absorbed by the calf during the first day of life. It is therefore important that the newly-born calf obtain this colostrum, preferably by suckling. Antibodies are normally produced in the cow's body as she builds up resistance to infection.

The buying of very young calves without their dams in saleyards is often a hazard as far as resistance to disease is concerned. *There is no substitute for colostrum.*

Colostrum produced in excess of the calf's requirements can be fed to other calves but it should be diluted with half its volume of warm water.

If a cow is milked out completely a week or more before calving, the colostrum will have been removed. Thus the newly-born calf does not obtain its colostrum unless some has been stored or preserved. The addition of a suitable antibiotic to normal milk may be helpful if a calf is deprived of sufficient colostrum.

Summarising, the calf should have its mother's milk for two to three days. Milk or reconstituted milk should provide most of the diet for the first month of life.

From One Month to Three Months.—At about a month of age the milk, skim-milk or reconstituted milk can gradually be replaced by meals. The protein content of the meal should be approximately 20 per cent. and over this two-month period the milk protein can steadily be replaced by vegetable protein such as peanut meal, cottonseed meal or linseed meal. Meat-and-bone meal and blood meal are other good quality protein meals and can be included if the farmer is prepared to take the trouble to get calves to eat them.

While only two or three weeks of age a calf may nibble at good quality crop or pasture and will commence to chew its cud. This indicates that the rumen (first compartment of the stomach) has commenced to function and from this time it enlarges fairly rapidly.

The rumen plays an important part in digestion of roughages, by reason of the presence of countless millions of bacteria which convert complex starches, fibre and proteins to substances which are readily digestible. The ruminal bacteria can use simple nitrogenous substances such as urea to build protein which becomes available to the animal when the bacteria die. Bacterial activity, therefore, breaks down roughage feeds and vigorous bacterial activity ensures that the calf makes best use of fibrous feeds. Provision of good quality roughage feed at two to three weeks of age and the maintaining of a continuous supply of such feed encourages early and complete ruminal development.

From Three Months Onwards.—When fed an increasing proportion of nutritious roughage from a month of age, the rumen will be sufficiently developed to three months for a high proportion of the diet to be roughage, again provided it is of high quality. From this age onwards an adequate daily supply of good quality roughage in the form of pasture or crop, supplemented with hay as needed, is essential for good growth and health.

At three months a calf will eat 2 or 3 lb. of meal daily. Meal should be fed according to the quality of available roughage and response of the calf. Provided adequate pasture or hay is fed it is not necessary to increase the meal allowance. Indeed, it may be reduced with a saving in expense.

In a later portion of this article the use of pasture and hay in rations for calves over three months is discussed further.

Feeding Systems

There are several systems used in rearing calves. To be successful, they must allow fo adjustment of nutritional requirements according to age. The foods that are available and thei relative costs, the type and size of dairy farm its locality and incidence of disease all collectively determine the system used. Stud breeders on cream supply often feed liberal amounts o wholemilk and skim-milk, while suppliers o wholemilk may restrict wholemilk feeding too severely, particularly during the winter quota period.

While greater emphasis is being placed on rearing calves with limited quantities of whole-milk, reconstituted milk (from milk powders) and milk substitutes (calf starter meals), i should be recognised that greater attention must be paid to husbandry if calves are to be reared successfully on limited quantities of milk.

Restricting the wholemilk allowance too severely may be false economy. The first six weeks of a calf's life are the most critical. Long-lasting, or even permanent effects, may result from faulty feeding during this period. Furthermore, disease takes a bigger toll at this age. Digestive upsets are often caused by over-feeding and it is sound husbandry to avoid this, especially during the first few weeks of life.

The systems of calf rearing can be classified according to the quantity of wholemilk fed—

1. Rearing calves on nurse cows.
2. Rearing calves on wholemilk (hand-fed).
3. Rearing calves on limited amounts of wholemilk plus skim-milk.
4. Rearing calves on small quantities of wholemilk plus reconstituted milk.
5. Feeding whey.

Rearing Calves on Nurse Cows.—This system is relatively simple. Calves do well and seldom suffer from digestive troubles and disease. Culls from the milking herd are used as foster mothers. One cow can nurse two to four calves at a time and she may rear a number of sets of calves during her lactation. The number of calves reared depends on the milk yield and length of time each set of calves is left on the cow. Each calf must obtain its colostrum from its dam before being suckled by the foster mother. It will grow well on ¾–1 gal. of milk a day. Each set of calves should be trained to eat meal and hay from two to three weeks of age if they are to be weaned at two months.

Rearing Calves on Wholemilk.—This is the simplest of the hand-feeding systems. Daily milk allowance should be 10–12 per cent. of body weight for the first fortnight. Thus an average sized A.I.S. calf would receive 3½ pints at each feed twice daily and a Jersey would receive 3 pints. These allowances should be adjusted to suit large, small or weak individuals.

With good management and attention, healthy calves can be reared on a total allowance of 20 gal. of wholemilk plus meal, but calves will carry more bloom in the first few weeks of life if this allowance is increased to 40 gal. Calf meal containing 20 per cent. crude protein should be fed from the third week onwards and increased steadily so that it will be eating 2 lb. daily in the seventh week when the wholemilk allowance can be tapered off.

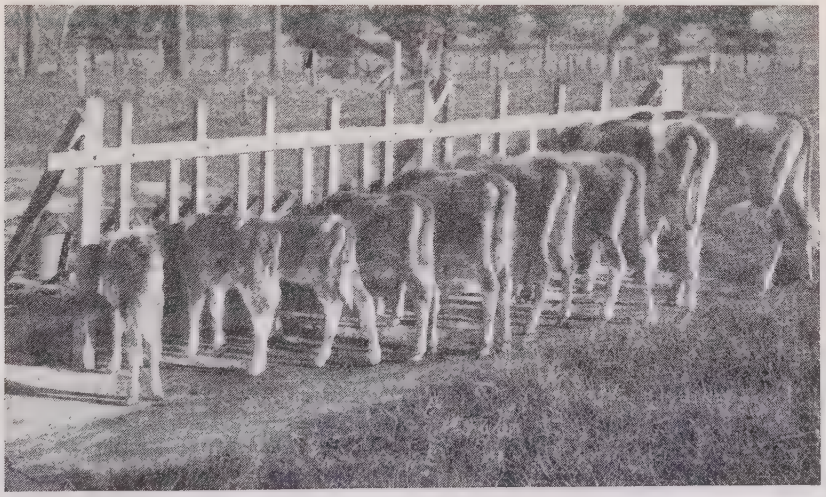

Plate 2

Wooden Feeding Bails May be Made to Accommodate Calves of All Ages.

Table 1 outlines the feed allowances. These are set out as quantities for each feed and the calves should be fed twice daily.

TABLE 1

Feeding Schedule for a Calf of 70 lb. Birth Weight

Age		Whole-Milk	Calf Meal	Lucerne Hay	Pasture
Weeks		Pints per feed	Lb. per feed 20 per cent. protein		
3–4 days ..	..	Colostrum	.. ..	Free Choice	Rotational Grazing
1st–2nd week	..	3½	..		
3rd–4th week	..	4	a little		
5th week	..	3½	¼		
6th week	..	2½	½		
7th week	..	1½	1		

The calf should be encouraged to eat meal, preferably dry meal, commencing in the third week. One satisfactory method is to place a small amount of meal in the bottom of the bucket after the milk has been consumed.

The calf meal should contain 20 per cent. crude protein, of which at least one-eighth should be buttermilk powder or skim-milk powder. There is a number of suitable calf meals, called calf starter meals, on the market. However, if the farmer has some home-grown grains and is prepared to mix his own calf meal he can make an equally nutritious meal at less cost.

A suggested calf starter meal is as follows:—

1 part buttermilk powder.
1 part peanut meal.
2 parts maize meal.
1 part barley meal.

Cottonseed meal or linseed meal may replace part or all of the peanut meal; and oatmeal, wheat meal or sorghum meal may replace the barley meal.

A pound each of bone flour (or bone meal) pulverised limestone and salt should be added to each cwt. of the mixture.

Provided pasture is young and nutritious and hay is always accessible, 2 lb. of the meal daily should be sufficient for good growth.

When the calf is three months old the buttermilk powder can be replaced entirely by a cheaper form of available protein such as peanut meal, cottonseed meal, linseed meal or meat-and-bone meal.

Wholemilk Plus Skim Milk.—This is a popular and good calf-rearing system on cream supply farms. Feed costs are probably less than in any other system. Wholemilk is fed for a number of weeks as in the previous system. Not less than 20 gal. of wholemilk is recommended to rear healthy calves. The change-over from whole to separated milk should extend over a period of two to three weeks. From the sixth week onwards the skim-milk allowance can be increased to ¾ gal. per feed. If reduced, a calf starter meal must be fed as in the previous system until the calf is three months old. One pound of calf starter meal is about equal to 1 gal. of skim-milk in energy value.

Table 2 outlines the feed (twice daily) allowance for this system:

TABLE 2

Age		Whole-Milk	Skim-Milk	Concentrates	Lucerne Hay	Pasture
Weeks		Pints/ feed	Pints/ feed	Lb./ feed		
3–4 days	..	Colostrum	..	..	Free Choice	Rotational Grazing
1st–2nd	week	3½	..	..		
3rd	week	3	½	..		
4th	week	2½	1½	¼		
5th	week	1½–1	2½	½		
6th	week	taper off	3½	¾		
7th	week		4—5	¾		

Calves fed according to this system will not have the bloom or grow quite so fast as those in the previous system but will catch up in growth by the end of the first year.

When the butterfat is taken from wholemilk by the separator the energy or fattening value of the skim-milk is half that of wholemilk but the protein and mineral content are practically the same. This makes it necessary when changing from whole to separated milk to provide supplementary feed (concentrates) until larger quantities of skim-milk can be fed without risk of digestive upsets. Wholesome coarsely ground grain mixtures or by-products such as bran or pollard are satisfactory. Protein-rich meals are not necessary. Any grain mixtures can be fed —the amounts will largely be governed by their cost and availability.

Skim-milk has practically no vitamin A, for this is removed with the butterfat. However, in normal conditions and provided there are no disease problems, the calf will obtain, at this age, sufficient vitamin A from pasture or good green leafy hay.

Wholemilk Plus Reconstituted Milk.—Substitute foods for wholemilk are sought during the winter-quota period when as much wholemilk as possible is sold and when many calves are reared.

Buttermilk powder and skim-milk powder are suitable substitute foods. They must be fresh, because stale or discoloured powders could cause scours. Furthermore, their nutritional value would have been reduced considerably. These two foods are about equal in food value. Table 3 shows the approximate energy value of buttermilk powder in replacing milk as a calf food.

TABLE 3

1¼ lb. buttermilk powder in 6 pints water = ...	1 gallon wholemilk
3½ oz. buttermilk powder in 1 pint water = ...	1 pint wholemilk
1 lb. buttermilk powder in 6 pints water = ...	1 gallon milk

Buttermilk powder is reconstituted by stirring it in water at blood heat (100 deg. F.) for at least a minute. It is then ready for feeding. An old cream stirring rod is suitable for this job.

Table 4 shows a feeding schedule (fed twice daily) using reconstituted buttermilk powder to replace wholemilk at the earliest age. Such early weaning off wholemilk is only possible where disease is controlled and where very good husbandry is practised. Allowances quoted are for an average size healthy calf. For weak, small or large calves the wholemilk allowance must be altered to suit the animal. Allowances are for each feed given twice daily.

From a month, the buttermilk can be replaced steadily by a proprietary calf meal or a home-made calf meal containing 20 per cent. protein.

TABLE 4

SHOWING BUTTERMILK POWDER TO REPLACE WHOLEMILK AT AN EARLY AGE

Age of Calf	Whole-milk	Butter-milk Powder	Calf Meal	Lucerne Hay	Pasture
Days	Pints per feed	Oz. per feed	20 per cent. Protein mixture	Free Choice	Rotational Grazing
1–3rd ..	Colostrum	..	..		
4–14th ..	3½	1	..		
15th ..	3	1½	..		
16th ..	3	3	..		
17th ..	2½	4½	..		
18th ..	2	6	..		
19th ..	1½	8	..		
20th ..	1	10	..		
21st ..	½	12	..		
22nd ..	taper off	14	..		
23rd–28th..	..	16	a little increase to 2 lb.		
29th–90th..	..	taper off			

A suggested mixture is as follows:

1 part peanut meal.
1 part maize meal.
1 part barley meal.

Cottonseed meal or linseed meal may replace part or all of the peanut meal. Oatmeal, wheatmeal or sorghum meal may replace the barley meal.

Add 1 lb. each of salt, bone meal or bone flour and pulverised limestone to each 100 lb. of the mixture.

At 3 months the buttermilk powder can be replaced entirely by peanut meal, linseed meal, cottonseed meal, coconut or meat-and-bone meal and the meal allowance can be reduced when sufficient young pasture and/or green leafy lucerne hay is fed. A simple mixture of 5 parts of grain to one part of protein-rich meal is suitable at this stage. Molasses can be used to replace part of the grain portion. One pound of molasses is equal in energy value to about ¾ lb. of grain. Molasses should be introduced gradually and the quantity reduced if scouring occurs.

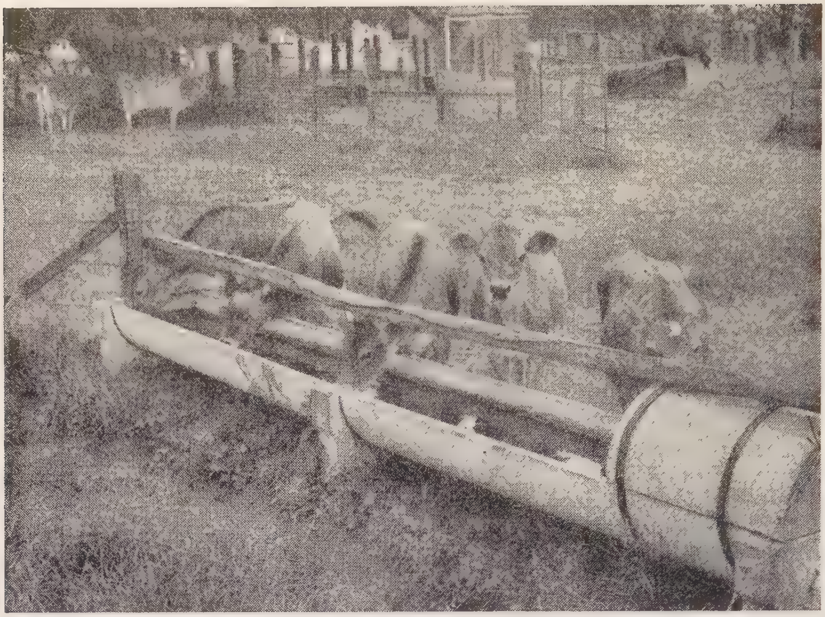

Plate 3

Clean Water Should be Available to Calves at all Times.

Feeding Whey.—Skim-milk is often scarce in cheese making districts but ample whey may be obtainable. The nutritive value of whey lies mainly in its sugar content. Its energy value is about two-thirds that of skim-milk, or one-third that of wholemilk. The fat and two-thirds of the protein have been taken in the cheese. In addition, it is rather laxative in action and needs to be introduced steadily, commencing in the fifth week.

TABLE 5

FEEDING SYSTEM USING WHEY

Age	Whole-milk	Whey	Calf Meal	Lucerne Hay	Pasture
Weeks	Pints	Pints	Lb.		
1–3 days ..	Colostrum	..	..	Free Choice	Rotational Grazing
1–2 weeks ..	3½	..	..		
3 weeks ..	4	a little	..		
4 weeks ..	3½	½	..		
5 weeks ..	3	1	¼		
6 weeks ..	2	2	½		
7 weeks ..	1	3	1		
8 weeks ..	½	4	1½		
9 weeks ..	..	5–6	2		

Antibiotics

Antibiotics are not a substitute for good husbandry and good hygiene. However, under special circumstances it appears that two antibiotics, oxytetracycline (Terramycin) and chlortetracycline (Aureomycin) are useful in the feeding of young calves when milk is in short supply.

The indiscriminate use of antibiotics in calf feeding cannot be recommended.

Pasture and Hay

The basis of rearing healthy well-grown calves at lowest cost from three months old onwards is the regular provision of young nutritious pasture. Supplementing with good quality lucerne hay, or clovered pasture hay, is beneficial, especially to counteract the laxative effect of very succulent feed.

When pasture is insufficient or declining in quality, as in autumn and winter, it should be supplemented with suitable hay.

Young clovered pasture or lucerne, and hay made from pasture or lucerne, are rich in all food nutrients and ensure good health and growth. The leaves are much more nutritious than the stemmy parts of hay and particularly in dry weather they become brittle and fall from the stem. Hay should therefore be fed in boxes or troughs or racks with troughs beneath to catch the leaves. A roof should be provided to protect the hay from the weather.

Observations on calf growth have shown that, when confined to second quality pastures, calves commence to lose weight in the autumn and do not regain that weight until the late spring, yet the skeleton may have grown a little. With such calves, normal development has been retarded by as much as a year and it can be assumed that subsequent production is reduced considerably. Observations in New Zealand have shown that gross under-feeding in early life has reduced production in the first lactation by 36 lb. of butter and in the second lactation by 24 lb. of butter.

Feeding and Management

Bucket Feeding.—Bucket feeding of calves is the most general method used. It is simple and buckets are easy to keep clean. Gulping of the milk may lead to digestive disorders and bucket-fed calves often have a habit of sucking appendages of their mates after feeding.

Nipple Feeding.—Feeding through rubber teats was first used half a century ago. A few dairymen still prefer this method. Its main benefits are regulation of speed of intake of milk and a reduction in the incidence of calves sucking one another since their urge to suck has largely been satisfied. A disadvantage is the extra pieces of equipment to be kept clean. More feeding bails are required in a nipple feeding system. Each young calf should receive its milk ration from an individual container.

Dry Meal versus Gruel.—Dry meal feeding commenced with the introduction of calf starters. Advantages of the method are a saving in labour of gruel preparation, probably a better digestion of food and less risk of over-feeding and digestive upsets because, by thorough chewing, the food is mixed with saliva and there is no risk of over-feeding.

A recommended method of inducing early eating of dry meal is to place a small amount in the bottom of the bucket as the milk is being cleaned up.

Grinding Grains.—Calves chew soft whole oats thoroughly until they are eight months old. But when a meal is added to increase the protein content of the ration it is advisable to crack, or grind, the grains to provide more complete mixing. Coarse grinding only is necessary, as grinding too finely reduces palatability and may reduce the need to chew thoroughly.

Calf Bails

Bails are necessary for good calf rearing. They ensure that each calf gets its share of feed and the reduction in labour is only fully appreciated when they are used. Calves lose their urge to suck each other when bailed up and fed hay or dry meal after their bucket feed. Calves are mimics and the sight of a neighbour eating its food encourages a hesitant calf to "give it a go".

Calf bails can be built of timber or metal, need only be of simple design and, if in a permanent position, should have a concrete floor and a roof to provide comfort to the feeder and calves during unfavourable weather. Portable bails built on skids are useful if, for some reason, calves cannot be brought to a central feeding site.

Rotational Grazing

Calves do better when rotationally grazed even when all feed is of good quality. A high level of nutrition and rotational grazing are the fundamentals of worm control in calves.

The size and number of paddocks should be adjusted to allow a change of feed at weekly intervals and a month's spell of each paddock before re-grazing. During that time a large proportion of worm larvae will have died, thereby reducing re-infestation.

Dehorning

A hornless herd has several advantages over a horned herd. The best method of dehorning the herd is to treat the calves. There are three methods of dehorning described in special Departmental publications.

Calf Identification

Whether purebred or grade, every calf should be permanently identified so that its complete history can be recorded. Calves can be identified by tattooing, ear-tagging or branding with numbers. This job should be done as soon as convenient after birth. Members of herd recording units have their calves tattooed free of charge.

Vaccination Against Blackleg

Blackleg tends to recur in well marked areas but it may not appear for several years. Veterinary advice should be sought concerning the advisability of vaccination in your district. Vaccination gives protection until two years old, after which age cattle are rarely susceptible to blackleg. In infected areas, calves should be vaccinated as a routine at four months of age.

Strain 19 and blackleg vaccinations should not be performed at the same time.

If an outbreak occurs all calves should be vaccinated from two months old and upwards. The younger calves do not acquire a lasting immunity from the vaccination, which should therefore be repeated at five to six months old.

Strain 19

Heifer calves should be inoculated with Strain 19 at four to eight months of age. This gives protection against brucellosis in later life. Bull calves must not be vaccinated as the germ may persist in the testicles. Revaccination is unnecessary.

TABLE 6

Normal Liveweight Gains (Lb.) of Heifers

Age	Ayrshire	Guernsey	Friesian	Jersey	A.I.S.
Months Average Birth Weight*	75	68	96	55	71
1 ..	86	79	115	70	98
2 ..	114	105	155	96	127
3 ..	156	141	207	128	161
4 ..	190	177	260	176	195
5 ..	243	220	317	220	232
6 ..	281	267	379	268	290

* Individual birth weights vary several pounds from these averages.

Measuring Growth Rate

Periodic weighing of young stock provides a good guide to the standard of husbandry. Comparisons of growth rate can thereby be made with accepted standards. Table 6 summarises data on growth rates of heifer calves of various breeds under most favourable conditions.

Data in Table 6 have been compiled from "Feeds and Feeding," 22nd Edition (F. B. Morrison) and records of the Department of Agriculture and Stock, Queensland.

Girth Measurements

Where calves cannot be weighed, liveweight can be estimated by measuring the girth immediately behind the forelegs and estimating the weight by using the following table:

TABLE 7

Estimated Weights of Well-Grown Jersey Heifers from Girth Measurements

Girth (in.) ..	26	28	30	32	34	35	36·5	38	39	40	41·5	43	44	45–6
Estimated Weight (lb.)	58	78	86	102	125	140	155	170	185	200	220	240	260	280–300

The weights of individual calves may vary several pounds from these estimates but this does not matter provided there is a steady gain.

From six months of age good quality pasture, without any supplementary feed, will provide for reasonable growth.

Information on other aspects of calf rearing are contained in the following publications available from the Department of Agriculture and Stock:

"Dehorning of Cattle"—Pamphlet No. 4.

"Try these Easy-to-Work Calf Bails"—Advisory Leaflet No. 183.

"Portable Calf Bails"—Advisory Leaflet No. 42.

"Blackleg"—Advisory Leaflet No. 54.

Advice on Strain 19 Vaccination appears in "Brucellosis (Contagious Abortion) in Cattle"—Pamphlet No. 6.

"Calf Scours"—A leaflet is being prepared for publication.

pasture and crop

Points in Furrow Irrigation.—Low cost and ease of application make furrow irrigation a favourite for row crops like sugar cane, cotton, tobacco, and potatoes. The method is used to water more than one-third of all the irrigated land in Queensland.

Success of furrow irrigation depends on getting uniform penetration of water to the root zone of the plants. To check the lateral spread and depth of penetration, cut trenches at the top, middle and bottom of the field immediately after watering. These will show the penetration pattern. Irrigation is efficient if the water meets half-way between the furrows and the soil is wet down to the root zone.

Dry patches between the furrows mean that the furrows are spaced too widely or that the flow is too fast for the soil type and slope.

—*A. NAGLE, Irrigationist.*

Check Your Instruments.—If a spot check was made of all tractors in operation today, the percentage of tractors in service with inaccurate engine speed indicators would surprise you.

The consequences of an error such as this can be serious when crop spraying, for instance. An inaccurate engine speed indicator can also prove deceptive during grain harvesting operations.

For example, a fairly new tractor equipped with an engine speed indicator on which the standard P.T.O. speed of 536 revs. was clearly defined was employed in operating an all-crop harvester. The grain samples produced were poor and adjustments made on the all-crop harvester failed to improve the samples. A check of the engine speed indicator revealed an inaccuracy of 150 revs. That is to say, although the speed indicator was registering 536 revs. the actual speed was found to be 484 revs. per minute. Due to the reduction in speed, the efficiency of the all-crop harvester was lowered particularly with regard to the shaker shoe and fan thus making complete separation virtually impossible. Opening up the throttle on the tractor to obtain correct speed soon had a clean sample flowing into the bag.

So remember—maintain correct speed for maximum efficiency.

—*C. G. WRAGGE, Agricultural Engineer.*

Impurities in Sudan Grass.—Growers, beware of Johnson grass and Datura seeds which often occur in Sudan grass seed! Johnson grass and Datura, if introduced with Sudan seed can become serious pests on your property as well as being injurious to your livestock.

Submit your samples of Sudan grass seed before sowing to the Seed Testing Station, Department of Agriculture and Stock, Brisbane. Four ounces of Sudan grass seed is sufficient. No charge is made when the seed is intended for a grower's own use.

The seed testing staff will always advise you on the purity and germination of your seed sample within a few days. The seed testing station operates for the benefit of growers. You are invited to make more use of this service.

—*E. PRODONOFF, Seed Specialist.*

Fertilizer is Hard on Combines.—Neglect to clean your fertilizer spreader or combine after use and you'll soon be paying for a new one.

Most fertilizers used today are extremely corrosive and, in addition, have a tendency to set rock-hard when exposed to the air. Corrosion can quickly damage sheet-metal hoppers and cause bearings to seize up. Fertilizer caked on a machine will cause breakages. Neglect will send a machine to the scrapyard far more quickly than fair wear and tear.

It's fatal to leave fertilizer in the hopper. It can be guaranteed to set solid in a short time. Even worse is to operate the drill in this condition, for this inevitably causes breakages.

All parts should be cleaned thoroughly before the machine is stored away. If necessary, the bulk of the caked fertilizer can be chipped off. Then a five-sixteenths heavy duty electric drill with one of the many types of wire scratch brushes can be used to reach awkward corners and to get down to clean metal. A rotary sander, with a wire cup brush attached in place of the disc, is equally effective.

Those parts that come in contact with the fertilizer should be painted every year. However, if you prefer it, you can treat the parts with some anti-rust compound or waste oil. After allowing some time for the paint to harden, operate the mechanism by hand to ensure that it is in order.

Whenever possible, machines that have been used for distributing fertilizer should be cleaned thoroughly immediately after use. If some delay cannot be avoided, at least empty the hopper and hose it out.

Don't overlook the seed boots attached to the coulters. These often cake inside with fertilizer, and should be cleaned thoroughly.

The swing from the coiled spring type of seed tube to new forms of plastic and convoluted rubber is a good one. The metal types are almost impossible to keep clean and have to be replaced every two years or so.

—*C. G. WRAGGE, Agricultural Engineer.*

What is an Honorary Crop Correspondent? From time to time you will have read in your newspaper, or heard over the air, an item such as "A survey by the Division of Marketing of the Department of Agriculture and Stock shows that the total area sown to the main summer grain and seed crops for the 1960 harvest is now estimated at about 340,000 acres." Did you ever wonder how this information is obtained?

The best source of this type of information is the farmer himself. He generally knows what is going on in his own district. Every two months the Division of Marketing sends to certain growers, a questionnaire and a reply paid envelope. The farmer fills in the appropriate part of the form and returns it to us. The people who help in this way are called Honorary Crop Correspondents.

When we receive reports they are arranged into production districts. Information on acreage and yield changes is extracted and analysed. Then we consider information from the Weather Bureau, from Departmental field officers and from other organisations who are concerned with the particular crop. When we are satisfied that we are as close as possible to the answer, the Division issues the forecast.

Those of you who are already honorary crop correspondents know much of the foregoing. From time to time it is necessary for us to expand our cover of a crop in some areas because our information is too slight to give us a reliable picture. During the coming year you could be approached to become an honorary crop correspondent. If you decide to accept, your help will be much appreciated.

—*R. RILEY, Statistical Officer.*

Clean Grain . . .

Makes Wholesome Flour And Cereal Products

Cleanliness in grain begins on the farm. Insects, birds and rats and other rodents that get into stored grain cause enormous losses. They waste the nation's food and eat away your profits. You can help cut these losses by making sure that all the grain you store and handle is clean.

You can keep rats and mice out with better storage construction. Poison and trap rodents and clean up places where they may hide and live.

It will save money to keep insects out. Fumigate old stored grain. Before storing new grain, get rid of insects by cleaning the bins and areas surrounding them. Spray bins with insecticide.

It might be necessary to use screens to keep out birds and poultry. Use ½ in. mesh on all windows and other openings.

12 Acres Of Irrigated Pasture Feed 26 Milkers

Twelve acres of irrigated pasture have answered the fodder needs of Beenleigh dairy farmer, Mr. A. J. Pagan.

Two milking cows to the acre cannot keep pace with the flush of green feed from late spring right through to late autumn. He has a surplus to mow and store for winter feeding.

But it wasn't always like that on his 30-acre farm on the bank of the Albert River. Eight years ago when Mr. Pagan, a sheepman from St. George, took over, the only pasture was a poor stand of paspalum and native species. The cultivation, now under irrigated pasture, had poor soil structure and low fertility due to intensive cropping.

Mr. Pagan turned to irrigated pasture to restore the farm's productivity and achieved success with a spray irrigated sward. But on this one-man farm he found the labour involved in moving the spraylines was just too much for him.

So in 1956-57, he changed over to the contour ditch system on 12 acres of gently sloping river country. Shortage of fresh water from the Albert River was a handicap in the 1957-58 drought year, but now, with normal seasons and a bigger pumping plant, his production is rising.

In 1957-58, his average yield from 22 milking cows was 336 gallons of milk containing 142 lb. of butterfat a head. Although 16 lb. of butterfat Last year, the average production from 20 cows was 487 gallons of milk containing 198 lb. of butterfat a head. This was 36 lb. of butterfat below his 1956-57 production, it was still 13 lb. above the average for his herd recording group. better than the average for his group.

Plate 1

Beenleigh Dairyfarmer Mr. A. J. Pagan (left) examines the Production Records of His Herd with Agriculture Department Herd Recording Adviser, Mr. S. Ivers.

Plate 2

There Was Pasture to Spare on Mr. Pagan's Beenleigh Farm last Summer. His herd of 26 milkers could not keep pace with all the forage produced on 12 acres of irrigated pasture. Surplus was cured and the hay stored for winter feeding.

Protein Worry

Mr. Pagan believes that his rising production is due mainly to good feeding.

"I graze the milkers on the irrigated pasture for 18 hours a day," he said. "From about Christmas on, protein shortage is my chief worry; the clover isn't making vigorous growth and paspalum alone just hasn't got enough. To combat this I'm feeding each cow a protein-rich meal of 4 lb. a day.

Continued high yields, Mr. Pagan says, depend on good pasture management. He believes in close grazing and mowing to keep the pasture short and the protein content high. The 12 acres of irrigated pasture are sub-divided into 3-acre paddocks, and these Mr. Pagan grazes in rotation during the winter. In summer, he permits his cows more extensive grazing.

For most of the year, the pastures have to be rrigated every week or 10 days. Pumping from the Albert River with a 6 in. centrifugal pump he can give 5 acres a 3 in. irrigation a day. Cost of a day's pumping is about £1.

Every year, after the winter, Mr. Pagan renovates his pastures with tine harrows. He fertilizes the pasture each autumn, applying 2 bags of superphosphate to the acre.

"It looks as though you must have super for production," he said. "In a recent wet season my dry paddock had plenty of feed from a paspalum-white clover pasture that had not been fertilized. To save the irrigated pasture, I put the cows into the rain-grown pasture and in a week production dropped by 10 gallons. As soon as I returned the cows to the fertilized pasture, production returned to normal."

As a milk supplier and grazing irrigated pasture, Mr. Pagan finds that April and May are the best months to bring in his calves. The clover has then started to make vigorous growth and continues to yield heavily until November or December.

"On my pastures, cows calving in April and May continue to milk at their top until November," he said. "Even though they've been in for some time, early-calved cows will pick up in their milk yields from July onwards. Cows calving in the third quarter start to go off at just the same time as the early calved ones, that is, in November as soon as the heat begins to suppress clover growth.

"I've proved this by checking my monthly herd recording summaries over a number of years."

Mr. Pagan is determined to avoid being caught by a drought. He has 3 acres of lucerne, partly irrigated, and from this he has 30 tons of lucerne hay in his barn. Surplus pasture he mows in the summer is also stored. In addition, he has 2½ acres of fodder cane which he uses for winter feeding.

"I find fodder cane is the best protection against bloat," he said. "The cows are never short of cane from July to November and I've never had any trouble with bloat. In September and October when the clover is a foot high, I give the cows a good feed of cane before putting them into the pasture."

Herd Records for Culling

Herd recording information is used to help Mr. Pagan in his culling. But he believes a farmer needs records for 3 years before he can make full use of the information.

"When you use herd recording figures to guide your culling, you don't have to worry whether you're culling a medium instead of a poor producer," he said. "You can usually pick the top cows, but even then it's satisfying to have your judgement backed up."

On his 30-acre farm, Mr. Pagan runs 40 cattle including dry cows and heifers. The 12 acres of irrigated pasture provide all the grazing for his 26-cow milking herd.

"I could do with a few more milkers to make full use of the pasture," he added.

* * *

Step Closer To Hybrid Sorghum

Hybrid grain sorghum bred in Queensland will probably be released to commercial growers next year, said the Minister for Agriculture and Forestry (Hon. O. O. Madsen, M.L.A.).

This follows the success of Agriculture Department trial plantings in central and southern Queensland in the 1959–60 growing season. Yields from these hybrid plantings were consistently 25 per cent. higher than yields from standard varieties.

The average grain sorghum yield in Queensland is in the region of 25 bushels an acre. An increase of 25 per cent. due solely to the development of hybrid strains would be a substantial reward for the cost and effort of breeding them.

If the results achieved in the carefully managed Agriculture Department trials can be matched in commercial plantings, hybrid sorghums are certain to supplant standard varieties. Old favourites like Alpha, Martin, Caprock and so on, which are among the leading standard varieties, will have to make way for the newcomers.

The hybrids have been developed from seed brought back by Mr. W. J. S. Sloan, Director, Division of Plant Industry, Department of Agriculture and Stock, from his study tour of the United States in 1957. To multiply the stocks of parent seed quickly, it was grown out-of-season in the 1958 winter at Ayr and in a glasshouse in Brisbane. The actual breeding work has been the project of Mr. R. F. Moore, a plant breeder at the Hermitage Regional Experiment Station.

In the United States, hybrids have lifted commercial grain sorghum production by 20 per cent.

The Department is now examining ways to develop a seed certification scheme for hybrid grain sorghum. This would have to be the foundation of any successful hybrid grain sorghum scheme. Like hybrid maize, seed from a commercial crop of hybrid grain sorghum would not be suitable for planting. A certification scheme would be needed to supply the seed for each year's sowing.

Foot-rot Of Cattle

By O. H. BROOKS, Divisional Veterinary Officer.

Foot-rot is a common disease of cattle, causing considerable economic loss through decreased production. Treatment is quite satisfactory in early cases but prevention through improved conditions and where necessary, vaccination should be the goal aimed at.

An epidemic of foot-rot can seriously upset a milking herd, causing a rapid decline in milk production. The complaint is usually more prevalent following a long period of wet weather, and tends to be of seasonal occurrence. During 1950, it was common to find that 30 per cent. of milkers affected by the disease had become permanently dry before being treated effectively.

The disease may make its appearance in dry weather, if cattle have to walk over stony ground or graze on hillsides and steep embankments. Under such conditions cases are of a sporadic ather than an epidemic nature.

Only Adults Affected

Foot-rot is confined to adult stock on account of predisposing factors necessary for the infection o gain entry to the soft tissues of the foot (see ater).

Bulls are very susceptible, especially when subected to the predisposing factors common to ows. Their extra weight would be an additional actor.

ources of Infection

Foot-rot is caused by a germ (*Fusiformis necrophorus*) which is found under a wide variety of conditions, wherever stock are ongregated.

The germ persists in soil for long periods, although it may not infect cattle until conditions are favourable for its penetration of the coronet and cleft of the foot.

After the germ passes through the skin of the coronet or cleft, it multiplies rapidly. This causes an inflammation which, on account of the closely knit structures of the foot, produces severe pain from pressure. The pressure over the affected area arises from the inflammation, exudates, and in the later stages, pus.

Symptoms

An animal begins to favour the affected leg soon after the infection becomes established. The symptoms become more pronounced within 48 hours until the animal moves reluctantly and often carries the leg. It is usual for only one foot to be affected. At this stage the swelling of the tissue above the coronet, and in the cleft of the foot, is readily seen after it is cleaned. Cases do occur where there is considerable lameness but no swelling.

The cleft of the foot is the more common site of entry of the germ, and the swelling is then located in this region. Pressure with the fingers over the affected area will produce evidence of acute pain. As the condition progresses, the swelling extends farther up the leg and may be observed as far as the knee or hock.

After a few days the skin over the affected area usually ruptures, and allows the escape of a thick, creamy pus, which forms into a scab. When this is removed, the underlying tissue is

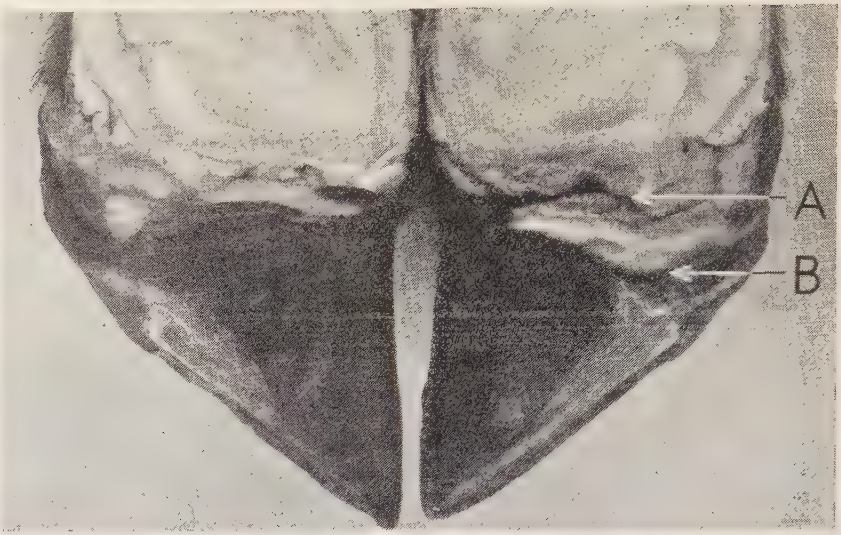

Plate 1

Section of Foot Affected with Foot-rot. Ulceration of the joint is shown at A and separation of the hoof at B.

in the nature of an ulcer; it has a raw fleshy appearance, and pus can be expressed from it. This tissue referred to as granulation tissue, eventually replaces the damaged and necrotic tissue in the process of recovery. In the more acute cases, several abscesses may form around the coronet, leading to the formation of channels from which discharges escape intermittently.

If untreated, the infection may penetrate to the deeper tissues, such as the tendons and joints of the pastern, when the loss of a claw is not an uncommon sequel.

Neglected cases of foot-rot usually result in the formation of a club foot. The accumulation of fibrous tissue laid down to localise the infection remains as a disfigurement, and the animal is usually left with a permanent limp, as the foot cannot make complete contact with the ground.

Such conditions often lead to overgrowth of the claws, which usually turn upwards to form long horn-like structures. Due to lack of wear, they continue to grow until the animal is unable to move with the herd and is usually culled.

Predisposing Causes

Any happening which lowers the resistance of the skin of the foot to infection may allow the entry of the foot-rot germ. The most common predisposing cause is prolonged wet conditions, when yards and watering places become very boggy and the softened skin is easily bruised. As stones are often used to minimise boggy conditions in yards, they can be a serious factor when they eventually become mixed with mud.

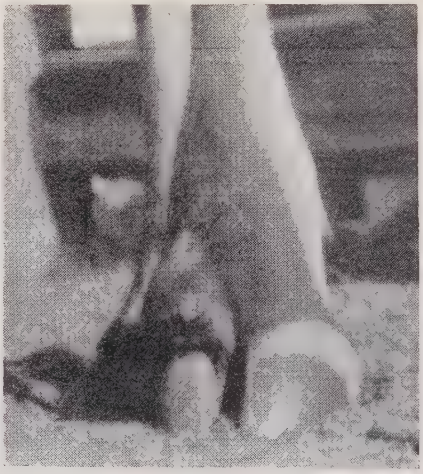

Plate 2

Foot-rot, Showing Ulceration Above the Coronet Extending into the Cleft.

The outlet to the bails is often a place where injuries to the foot occur, especially when the soil is eroded away from the concrete floor, leaving a considerable drop into a mudhole. Deep hoofprints, made in wet weather, often cause foot damage when the ground dries and hardens. Such irregularities are common around gates, dams and water troughs.

Stony ground, especially on hillsides and steep embankments, can be a serious predisposing factor, also deep eroded cattle pads on embankments and leading to the bails.

Cattle stalls with earth floors become contaminated and are a serious source of infection, as the predisposing factors are usually present under these circumstances. The use of a footbath at showgrounds has proved effective in minimising the infection from this source.

Treatment

One dose of 100 c.c. of sodium sulphamezathine solution (33⅓ per cent). given as an injection is sufficient to treat the average dairy cow, provided it is applied before extensive damage to the hoof has occurred. A second dose may be necessary in 2–3 days, if the esponse is not complete.

Penicillin, given as a single massive dose of bout 3,000,000 units, is also effective, and may be a little cheaper.

Where a footbath is available, good results are sometimes obtained by allowing the affected animal to stand in a bath of a 10 per cent. solution of bluestone for 20 min. daily for a few days. This form of treatment may also be used as a preventive when the cattle walk through a bath on their way to the bails.

Prevention

Where foot-rot reaches epidemic proportions, the removal of predisposing causes becomes worthwhile. Steps can be taken to ensure that the holding yard and surroundings of water troughs and dams do not become excessively boggy. A concrete pathway leading from the bails has been found to be an advantage. Concrete floors in stalls likewise are of value.

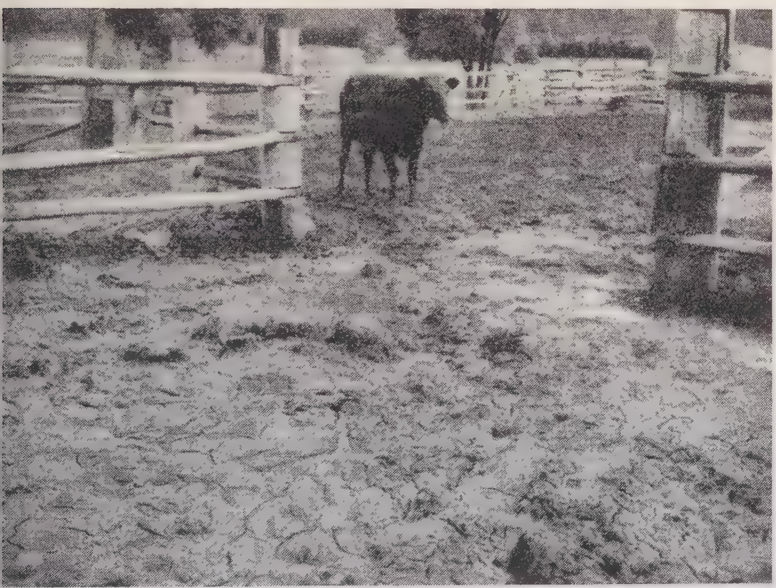

Plate 3

A Yard Such as This is Often Responsible for an Outbreak of Foot-rot.

Vaccination

A reliable vaccine is now available for the prevention of foot-rot. While improved conditions in the bails and yards must not be neglected, vaccination has given very good results in problem herds. The protection afforded by vaccination lasts only 12 months, but annual vaccination of the whole adult herd prior to the onset of the wet season should be considered on properties where recurrent outbreaks occur.

Providing Better Conditions For Useful Wildlife

By C. ROFF, Fauna Officer

It is practicable to maintain and improve conditions for wildlife on farms and grazing holdings at negligible cost, and without undue interference with normal agricultural or pastoral activities.

On most land in Queensland there is sufficient food for some native birds and other animals for most of the year; insects, wild and cultivated fruits, grass seeds, and green plants are usually

Plate 1

Farm Dam at Maleny

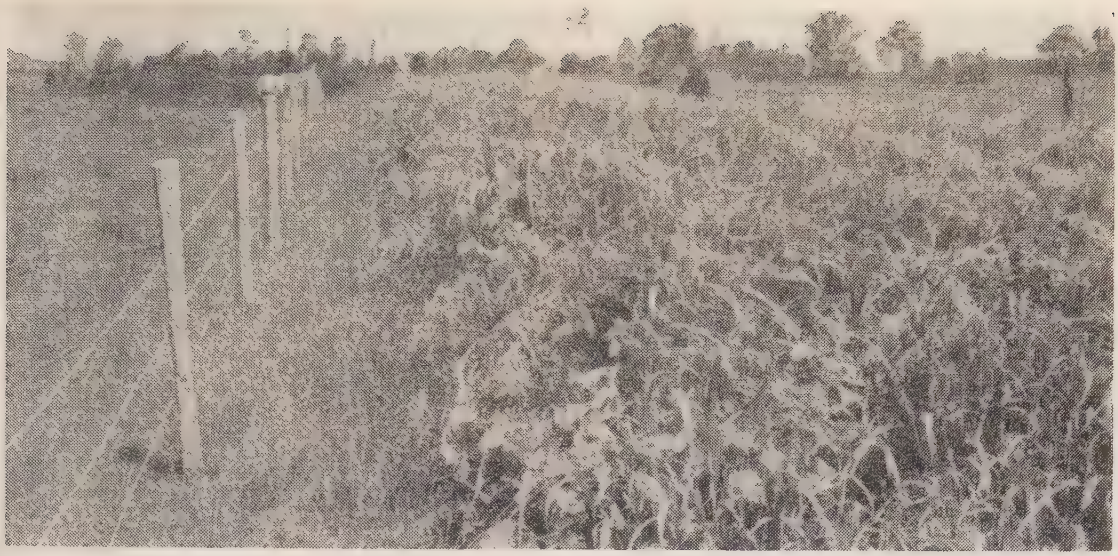

Plate 2
A Mixed Pasture of Poona Pea and White Panicum at Cooroy

vailable. During critical periods, which ary with weather conditions, the farmer assists ative fauna to some extent when he plants inter crops, or leaves unharvested that part of crop which is close to their shelter.

Several kinds of shelter or harbourage are equired by wildlife. Some conceal nests and oung; others provide food, shade from the hot un, and cover from rains.

Other shelters help with escape from enemies, nd afford protection against the cold and wind winter.

Good shelter consists of grasslands, dense hrubs and clumps of trees. All three kinds hould be close together and near available food upplies.

Wildlife obtains its liquid requirements both om free water such as surface water and dew, nd from food, which is seldom if ever completely y. In some areas wildlife exists entirely on ucculent foods and dew, but for waterfowl rface water is a necessity.

Fortunately, farms or holdings usually have fficient water to meet the demands of birds d mammals. The fencing of stock-water dams d the enclosing of an area planted to grasses, shrubs and trees helps to increase faunal populations by providing water, food and homesites. In addition, wildlife productivity of swamps and other natural water areas is increased by better impoundments, level controls, channelling and regulated grazing.

Improving Waste Areas

A waste area may be improved by providing basic food and shelter requirements. In this State, eucalypts, pines, athel trees, and privet are suitable for planting to encourage wildlife. It would be as well for farmers to consult the local Forestry Officer for suitable trees for their locality.

On the farm or near the homestead these shelterbelts and windbreaks create homes for insect-eating birds, close to crop land, where they can do the most good. These also provide travel lanes for many kinds of wildlife; and incidentally help control wind erosion and lessen the drying effect of wind on the soil.

If native grasses are sparse and increased quail populations are wanted, any of the following are helpful, particularly as mixed coverages—white and subterranean clovers, annual medics, rye grasses, *Phalaris tuberosa,* Japanese millet, white panicum, Poona cowpea, and cocksfoot. Again farmers might consult their local Agricultural Adviser for the best mixtures for their district.

If possible do not try for a heavy stand, because nesting birds like to see what is coming their way. Incidentally, some of the native pest fauna, and these of course are not welcome, prefer heavy stands of grass.

If waste areas already contain some of the food and cover producing plants mentioned, there is no need to plant more. Just fill in the kinds of plants that are absent and it is particularly important to construct a fence to keep livestock out.

A question that naturally occurs to the landholder who has only light faunal populations on has property is, "Where will the wildlife come from to stock the sanctuary provided?" Not infrequently, a few pairs of birds or mammals already exist in the neighbourhood, and under more favourable conditions, by natural increase and migration, these few will soon multiply.

Plate 3

Privet Windbreak and Improved Pastures on the Maleny Tableland

If there is any doubt about this latter point, watch the native animals that are attracted to a pond or dam when natural conditions are harsh.

Where food, shelter and water are made available, the amount of wildlife that can be found is surprising.

* * *

Mould Resistant Tobacco In Sight

Release in Queensland of New South Wales tobacco varieties with a high degree of resistance to blue mould is awaiting the results of manufacturing tests. If the tests are favourable, some seed should be available to Queensland growers in the 1961–62 season. Blue mould is at present the greatest threat to the Australian tobacco industry. It destroys up to 25 per cent. of Queensland's tobacco leaf each year.

Three tobacco varieties highly resistant to blue mould have been bred by Mr. H. Lea, of the New South Wales Department of Agriculture. The Hicks variety is the main parent used in the production of these strains.

Because of the promise shown by the varieties, the Central Tobacco Advisory Committee recommended trials in all tobacco-growing States last season. The aim of the trials was to assess the possibility of early release of seed to commercial growers.

In Queensland, the varieties gave promising results under farm conditions on Agriculture Department experiment stations at Inglewood and Parada.

Leaf produced from the same varieties i New South Wales is now being tested by manufacturers. If these tests show that the leaf i suitable for processing into tobacco and cigarettes, the way will be open to release the mos promising varieties immediately.

It is unlikely that manufacturers will complet their tests in time for seed to be available for th coming season. But in the meantime, th Queensland Agriculture Department will conduct further field and laboratory tests. The new strains will be grown at the Inglewood an Parada tobacco experiment stations and in th Lower Burdekin. They will also be grown o one or two commercial farms in each of th main tobacco growing districts in the State.

Farmers are warned against saving seed of an blue mould resistant varieties that they migh grow. Fresh seed must be produced each yea by specially trained staff who can cross-pollinat the particular parents involved.

—W. J. S. SLOAN,
Director, Division of Plant Industry.

Ducklings Drank Themselves To Death

By P. D. RANBY, Veterinary Officer.

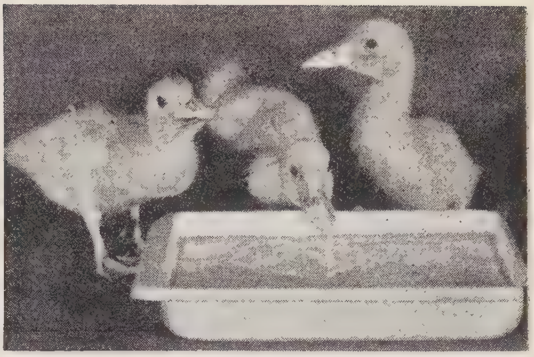

Plate 1: **These Three Ducklings are Survivors of the Case in Question, Photographed a Few Days Later.** They are from a flock of ducklings which, on two occasions, had overdrunk as a result of excessive thirst. Overdrinking resulted in immediate collapse and some deaths.

Don't let ducklings go thirsty. Take care to have plenty of clean drinking water in front of them all the time. If ducklings become very thirsty, they are likely to die from overdrinking when they are next watered.

An example of this trouble occurred recently on a farm near Brisbane. The owner had a flock of mixed three and four week old Muscovy ducklings which appeared to be thriving. One morning he found their water trough empty and filled it. The ducklings went crazy for the water and drank it greedily.

After four or five minutes of continuous drinking, one duckling rolled on its back, paddling is legs. The same thing quickly happened to the remainder, and soon all ducklings were lying collapsed around the water trough. In about 10 minutes they began to recover, but were very groggy for a while. On examining the water trough, the owner found it was leaking. The ducklings had evidently been without water during the night.

One morning 10 days later, the water trough was again found empty. The owner had noticed the trough nearly empty late the previous afternoon and had forgotten to fill it. As a result, the ducklings were without water for some time. When the trough was filled at 9.0 a.m., the ducklings again drank greedily and collapsed as before. But this time recovery took twice as long (20 minutes), while some of the ducklings failed to recover at all. The owner suspected poisoning.

However, it was pointed out to him that this was simply a case of overdrinking. Rapid, excessive drinking distends the small intestine. The stretching of the bowel wall causes severe pain and reflex nerve effects. Under these conditions, the nerve reflex would cause the heart to flutter, which, if severe enough, will lead to heart failure and death.

Ducklings drink much more water than chickens and must always have a water supply at hand. If allowed to become very thirsty, there is always the risk that they will overdrink when water is supplied to them. The danger of death from overdrinking is very real.

When sudden deaths occur among previously healthy ducklings, keep in mind the possibility or overdrinking after excessive thirst.

How To Avoid Milk Taints

By **W. C. T. MAJOR, Dairy Technologist.**

The causes of undesirable flavours to be found in milk and milk products are discussed, and recommendations are made for the elimination of these unwanted and economically damaging taints.

Although the flavour of dairy products may not affect their nutritive value, people eat less of these "protective foods" when undesirable weed, feed or other flavours are present. Such a lowering of consumption reacts unfavourably on the economy of the dairy industry. Not only is the volume of sales depressed, but the price per pound of the product is also reduced. It is, therefore, in the interests of consumers, processors, and producers to ensure that undesirable taints are kept out of dairy products, particularly milk, cream, butter and cheese.

What is Desirable?

It is desirable that the dairy product be always palatable. It must be attractive in itself, and be attractively merchandised. It should have a rich colour, a good body, a pleasant aroma and a clean, uniform, characteristic flavour, free from any unnatural or objectionable taint. The flavour and appearance must be both uniform and attractive.

Secondly, the chemical composition of the product must be well balanced. The fats, proteins, carbohydrates and minerals must be present in the correct form, and bear the correct ratio to each other.

Thirdly, the bacterial content must be satisfactory. There must not be any harmful germs, whether of human or animal origin. Some dairy products, notably butter and cheese, depend on the by-products of microbiological activity for their characteristic desirable flavour and aroma. These organisms must be present, and have the correct conditions for development. However, the presence of organisms capable of producing undesirable fermentations (such as bitterness, gas, ropiness, fruitiness, fishiness and maltiness) is most undesirable. It is equally important to maintain conditions which will not permit undesirable organisms to produce products which will taint dairy products.

Fourthly, milk and its products must be free from abnormal flavours due to either the feeds or the weeds which the cows have eaten. Under Queensland conditions, 45 to 55 per cent. of the butter packed as choice, and degraded for various reasons, is degraded for weed taint. To this must be added the vast amount of butter packed at grades lower than choice because of the weed taint recognised in the milk or cream on arrival at the factory.

Weed taints, therefore, play an important part in reducing the palatability and price of large amounts of milk, butter, cream, and cheese.

On the other hand, unaffected dairy products have a desirable attractive flavour which excites the palate and stimulates increased consumption.

Feed Flavours

The fodder, crops and pastures eaten by the cow impart characteristic flavour and aroma to the milk she produces.

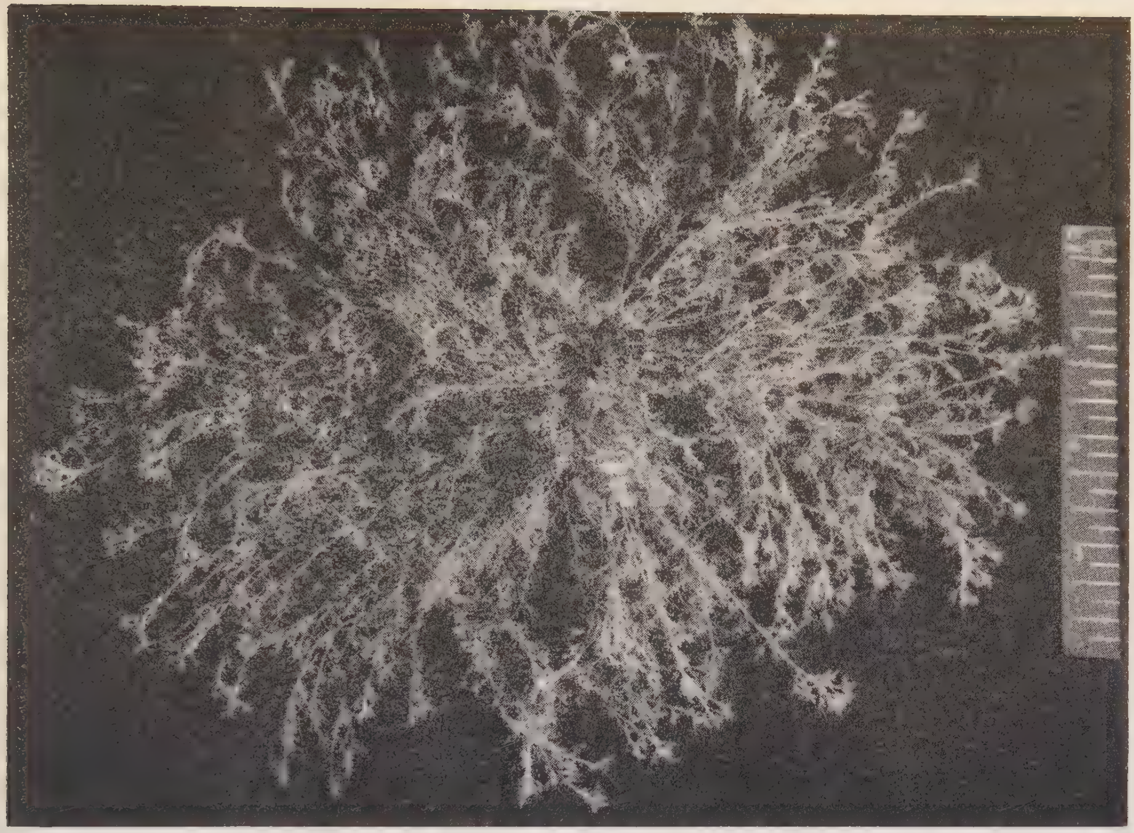

Plate 1

Bitter Cress or Swine Cress (Coronopus didymus).

For example, when cows are milked immediately after grazing lucerne, the milk has a strong, objectionable lucerne taint. However, when the cows are removed from the lucerne some time before milking commences, the lucerne taint is less pronounced.

The longer the interval between grazing and milking, the less pronounced will be the taint.

No matter what feed the cow eats, it will influence the flavour of her milk. Native grasses, oats, Sudan grass, peas, sorghum, maize, improved pastures and clover all impart their own characteristic flavour and aroma to the milk produced. Some feeds produce acceptable flavours, whereas others are objectionable to varying degrees.

In general, if the herd is removed from taint-imparting feed from 3 to 4 hours prior to milking, then the milk produced will not be markedly affected by undesirable feed taints. This cannot be taken as a hard and fast rule, because the time varies from one locality to another. It is also influenced by the amount, the nature, and the variety of the feed consumed.

Where supplementary feeding is practised, another factor is also important, namely the absorption by the milk of the aroma of the feed. Therefore, if an untainted milk is required it is necessary for such fodders as silage, brewer's grains, pineapple waste, chopped green crops, ground grains, meatmeal and bloodmeal, to be fed in such a manner, and at such a distance, that their aroma cannot be detected in the milk room. It is also desirable to feed the cows after they have been milked, not immediately before milking.

Weed Taints

Weed taints are, usually, more serious than feed taints. Many weed taints are most objectionable. Some weed taints are reduced during factory processing, whereas the flavour of others is intensified during pasteurisation. Some are almost undetectable in cold, unheated milk or cream, but are most objectionable in heated milk or cream. This is particularly so with some varieties of cress, for example, lesser swine cress (*Coronopus didymus*) (Plate 1). Other important taint-producing weeds are pepperwort (*Lepidium bonariense*) pepper cress (*Lepidium hyssopifolium*) shepherd's purse (*Capsella bursa-pastoris*) and slender celery (*Apium leptophyllum*) shown in Plates 2, 3 and 4.

Many of the taints imparted by weeds are not eliminated during an interval of 3 to 4 hours between ingestion and milking. Some taints appear immediately after ingestion, whereas others take hours to appear.

Moreover, minute amounts can cause serious damage.

One cow nibbling some weeds will produce enough tainted milk to spoil the bulked milk from the whole herd. Similarly, weed-tainted milk or cream from one supplier is capable of spoiling an entire vat of milk or cream at a factory.

Control of Weed Taint

Where milk is being used for pasteurisation and bottling, or cream is being used for the table cream trade, it is necessary for it to be taint-free. If milk is being used for cheesemaking, or cream is being used for buttermaking, some (but by no means all) taints can be reduced during processing. In this way, some milk which is unsuitable for the bottled milk or table cream trades may be used to produce choice quality butter or cheese.

However, other weed and feed taints survive processing and so spoil butter or cheese.

An examination of grading figures reveals that 90 to 95 per cent. of the degrading for weed takes place between July and December, the vast majority being in July, August, September and October, which is the period of:

- minimum growth of dense ground-covering, summer-growing pastures;
- maximum feeding of cultivation crops;
- scarcest amount of farm grown feed.

The control of weed taints is, at present, being investigated along two distinct lines:

The first is treatment of tainted milk, or milk products, to remove, or markedly reduce taints. Results, to date, indicate that some weed taints cannot be easily removed from milk or cream. However, these investigations have shown that butter-oil free from weed taint can be produced from strongly weed-tainted dairy produce. This weed-taint-free oil can be used to produce high quality ice cream mix and various reconstituted

Plate 2

Pepper Wort (Lepidium bonariense).

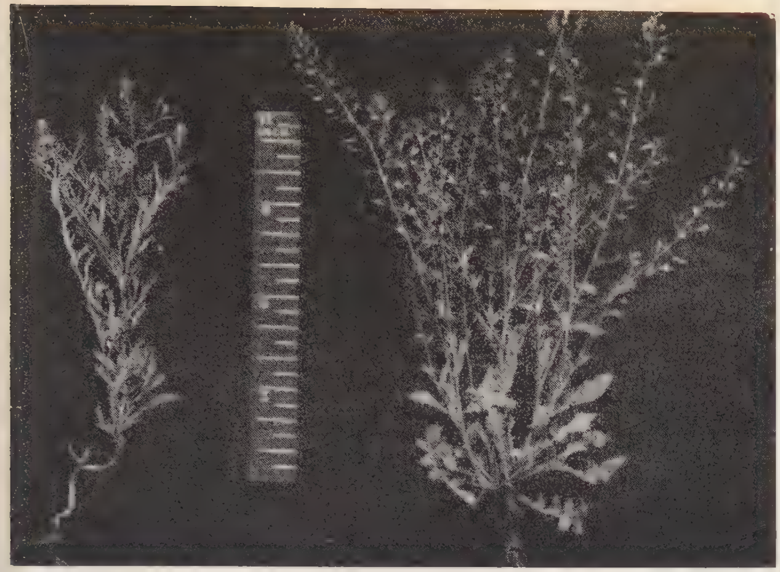

Plate 3

At Left: Pepper Cress (Lepidium hyssopifolium).

At Right: Shepherd's Purse (Capsella bursa-pastoris).

dairy products, whereas the original weedy butter was quite unpalatable. However, the cleaned product is no longer butter.

The second treatment is the development of a system of farming which will avoid the production of weed-tainted milk or cream. The farmer desirous of supplying milk or cream free from weed and feed taints has three alternatives. His immediate routine may combine all three alternatives, while he so organises his farm and resources to ultimately employ only one. The alternatives are—

(1) Feed the milking herd exclusively on fodder crops, pasture or concentrates which do not produce undesirable taints in the milk or cream supply. (This may well be the ultimate aim.)

(2) Feed taint-producing fodder crops, pasture, silage, or concentrates early enough to enable the taint to disappear before milking (with adequate aeration and cooling this may extend the variety of fodder crops, pasture and concentrates sufficiently to enable the supply of a suitable cream for buttermaking or milk for cheesemaking, or give some relief while changing over to the first alternative).

(3) Taint-producing plants, particularly weeds, can be removed from the crops and pastures grazed by the milking herd. It is also necessary to eliminate these plants from the yards, laneways, watering places and rest areas frequented by the milking herd. This could well be one of the first steps taken by the farmer in his drive to produce milk and cream free from weed taint.

The production on the farm of milk or cream free from weed taint involves first class farm husbandry, with emphasis on the elimination of taint-producing weeds from those areas of the farm which are grazed, or frequented, by the milking herd. This involves the judicious use of farm implements to give adequate moisture retention and satisfactory tilth at seeding to ensure good germination of crops and their subsequent rapid and vigorous growth—probably assisted by adequate fertilizing and the sowing of high germination, weed-free seed.

Adequate fencing is essential to ensure controlled, intermittent grazing to maintain good ground cover and rapid plant recovery which will discourage weed invasion and establishment.

The judicious use of selective weedicide and the chipping hoe may also be necessary.

It may be necessary on many farms to increase considerably the amount of fodder available to each cow from July to December, inclusive. This is because weeds are often the main source of green feed for the dairy herd for part at least of these months particularly in paddocks previously used for summer-growing crops.

It is essential to keep the ground well covered to prevent the germination of weed seeds, and this cannot be done unles there is an abundance of fodder available to the dairy herd. Close grazing permits weed invasion and establishment.

It is suggested that:

(*a*) The most productive areas of the farm be thoroughly prepared and sown down to appropriate crops or pasture.

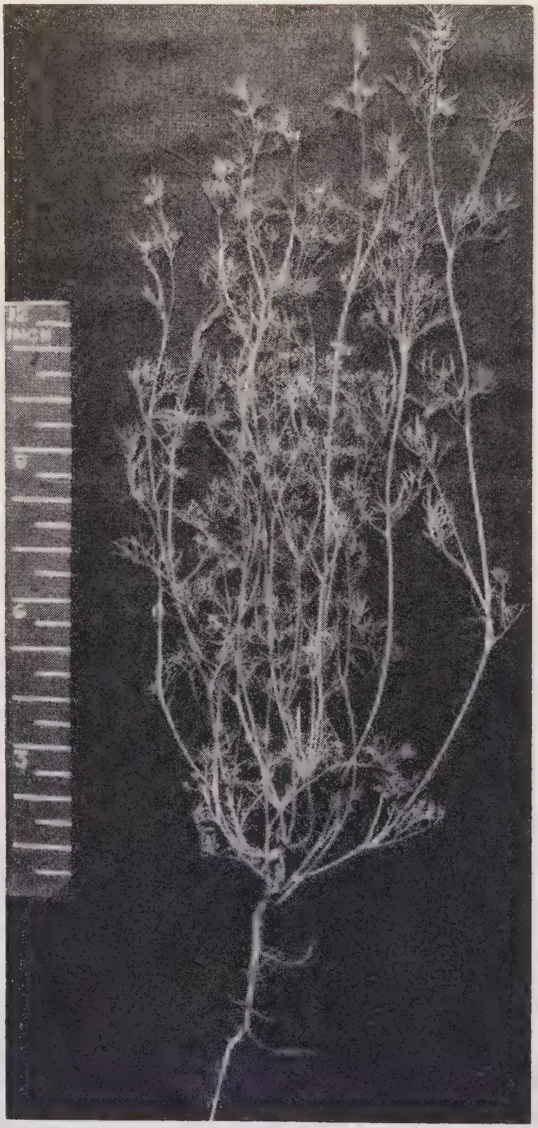

Plate 4

Slender Celery (Apium leptophyllum).

(*b*) Weeds be eliminated from these areas.

(*c*) These weed-free areas be judiciously grazed by the milking herd (giving weed-free milk or cream on some days during the troublesome period). If you are short of feed never flog these specially prepared areas.

(*d*) Each year the "weed-free" area be extended until at least the milking herd have access to only weed-free pastures, crops, fodder, and concentrates.

(*e*) It may be uneconomic to maintain the whole farm "weed-free" but the infected areas can be used for "dry" cattle, other farm animals, or non-dairy cash crops. Naturally, it will be necessary to exclude the milking herd from this area when taint-producing plants are present on it.

Chemical

The palatability of milk and its products can be spoilt by chemically induced changes, such as "cappy", "cardboard", or "oily" flavours. The development of these flavours is frequently accelerated by traces of copper and iron from worn brass fittings on milking machines, coolers, or cans from which the protective tin coating has been partly removed. These changes are further accelerated by exposure of dairy products to sunlight—as, for example, when milk in clear glass bottles is exposed to sunlight.

Other "chemical" changes which spoil the attractiveness of dairy products are those such as rancidity. These are frequently due to the activity of enzymes, either liberated by microbial contaminants, or from the udder (due to either disease, malnutrition, or unduly prolonged lactation).

Subnormal chemical composition of dairy products frequently correspondingly reduces the attractiveness of both the flavour and the appearance of dairy products.

Microbiological

Milk, cream and many dairy products provide enough food and moisture to permit contaminating bacteria, yeasts and moulds to grow actively in milk and milk products. These micro-organisms can only grow by altering milk solids into other chemicals, many of which impart an undesirable flavour and aroma to the product. It is therefore necessary, if we are to produce palatable human food to:

(1) Keep contamination to the economic minimum.

(2) Take steps to reduce the growth of the contaminant to a minimum.

The steps usually taken are—

(*a*) Rapid cooling followed by cold storage of milk and its products.

(*b*) Partial or complete dehydration of the product during processing.

(*c*) Control of the acidity of the product.

Accidental

Milk and its products are capable of absorbing odours from their containers or their surroundings. The odour of such things as kerosene, dieselene, disinfectants and tickicides is sometimes quite readily detectable in milk and cream when received at dairy products factories.

A very objectionable aroma develops inside cans when the lids are placed on them at the factory before the inside of the can is dry. This objectionable odour is accentuated when the cans, with lids on, stand in the sun on the roadside on return to the farm. Unless such cans and lids are very thoroughly washed, drained and racked at the farm, this taint will be apparent in the milk or cream forwarded to the factory.

It is also important that the drainage and sanitation of the milking shed, yards and surroundings be satisfactory, otherwise unpleasant odours can be taken up by the product. It is just as important not to store malodorous substances in or near the dairy buildings.

Unless the rubberware of the milking machine is always thoroughly cleaned and replaced before it becomes soft, spongy, or cracked, it will impart an objectionable odour to milk and cream. Objectionable odours can also be imparted from other unclean equipment, in addition to the undesirable "fermentation" changes brought about by the microbial contamination from unclean equipment.

Although the presence of extraneous matter, such as insect parts, dust, hair and chaff, may or may not affect flavour (depending on the nature and activity of the microbial contaminants associated with it), the presence of extraneous matter does very adversely affect the appearance of the product. It reacts adversely on both the volume of sales and the price per pound of product. It is necessary therefore to take adequate steps to prevent extraneous matter getting into milk or milk products.

To Sum it Up

The production of palatable, attractive dairy products is nutritionally and economically desirable. To achieve this object, it is necessary to:

(1) Milk only healthy, well-fed cows.

(2) Eliminate taint-producing plants from pastures, crops, conserved fodder and concentrates, and do not feed pastures, crops, conserved fodder or concentrates which will produce undesirable taints in milk or cream.

Eliminate taint-producing plants from yards, laneways, watering and resting places frequented by the milking herd.

(3) Use only clean equipment in sound mechanical condition.

(4) Keep the temperature, moisture content, and acidity of milk, cream and milk-products within limits known to result in the production of desirable flavour, body and aroma.

(5) Maintain the chemical composition of the products above certain well-known minimum standards.

(6) Protect the product from the damaging effects of sunlight, age, metallic contamination, and enzymes.

(7) Keep the equipment, particularly the milking machine rubberware, in sound mechanical condition, clean, and free of any objectionable aroma.

(8) Produce, process and store milk and its products under such conditions that it cannot absorb taints from its containers or surroundings.

(9) Keep out extraneous matter.

Good dairy products have an attractive appearance, a pleasant flavour and aroma, and are free from taints.

Paspalum Ergot Poisoning Of Dairy Cows

By O. H. Brooks, Divisional Veterinary Officer.

Dairymen in the areas of paspalum pasture such as the Mary Valley, Eungella Range, and Atherton Tablelands are often bewildered at the peculiar behaviour of their cattle as they are driven to the bails.

While there are a number of plant toxins which may cause nervous disorders to muscles of the leg, the spasms produced by the paspalum ergot are characteristic.

Wherever paspalum grows in Queensland, the seed-head becomes infected with ergot fungus, which replaces the seed with a ball-like structure. The fungus produces ergot which gives the seed-head a heavy dark appearance.

During most years the paspalum seed-head is affected by the ergot fungus. The dark sticky syrup-like exudate from the seed-head is a constant hazard to clothes. The faces of cows and horses are the first to show its presence.

The fact that many dairymen have not experienced a case of ergot poisoning speaks for itself, as it is the exception for cattle to become poisoned.

Ergot poisoning is to be seen only under special circumstances. Normally the seed-heads affected by ergot are not eaten.

However, sometimes when the ergot is at a certain stage of development cattle may become poisoned within 24 hours.

It is usual to find more cases of ergot poisoning during the periods of high humidity and heavy rain of the monsoonal season.

It is not usual to find more than a few in a herd affected at any one time. Occasionally, about one-third of the herd may show varying symptoms of poisoning.

Milk production may drop rapidly when the ergot is thick on the grass.

What Are the Symptoms?

Ergot is a nerve toxin. It causes symptoms similar to those produced by strychnine. The muscles tremble and twitch in the early stages. Later the muscles become cramped or severely contracted. This causes the cow to hold her head high, and walk with a stilted gait. The legs paddle as though out of control, and are usually flung outwards to maintain balance.

Animals will walk for a distance in this incoordinated manner, and then fall down from exhaustion.

Affected animals when approached are usually nervous (especially with strangers), as they cannot move away freely. They fling themselves around, especially if on concrete, and often fall over and remain on the ground for some minutes, paddling aimlessly.

In keeping with the excitement, the eyes are usually more pronounced, and in some cases blindness may occur. Champing of the jaws and frothing of the mouth is also a feature. The bowel movements are over-stimulated and scouring is usual.

A less violent symptom of ergot poisoning is a sudden dropping off in production of the herd when the ergot is washed on to the flag during rain.

In the more chronic cases, ergot may cause soreness of the feet, and a discolouration of the teats. This symptom is due to the adverse effect ergot has on the blood supply to these regions; there is an insufficient supply flowing through the tissue thus causing local necrosis. Unlike the ergot produced by rye, the paspalum ergot does not appear to be responsible for abortions, except in very odd cases. Misadventure during the toxic spasms is more likely to be the actual cause of abortion.

What Can Be Done?

Affected cattle are best left alone. If treatment is desirable, then dosing with epsom salts at the rate of 12 oz. for Jersey, and 16 oz. for A.I.S., can be adopted.

Paspalum can be prevented from heading freely by pasture rotation and mowing.

When a paddock is heavily affected with ergot, it should be spelled.

Where the ergot has become a real problem, some farmers have sown down other grasses such as kikuyu.

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Brucellosis-Tested Swine Herds

(As at 1st June, 1960)

Berkshire

Clarke, E. J., Mt. Alford, via Boonah
Cochrane, S., "Stanroy", Felton
Cook, F. R. J., Middle Creek, Pomona
Crawley, R. A., Rockthorpe, Linthorpe
Edwards, C. E., "Spring Valley" Stud, Kingaroy
Farm Home For Boys, Westbrook
Fletcher, A. C., "Myola" Stud, Jimbour
French, A., "Wilson Park", Pittsworth
H. M. State Farm, Numinbah
H. M. State Farm, "Palen" Stud, Palen Creek
Handley, J. L., "Meadow Vale", Lockyer
Handley, G. R. "Lochlyn" Stud, Lockyer
James, I. M. (Mrs.), "Kenmore" Stud, Cambooya
Kath, E. E., "Topcamp", via Toowoomba
Kimber, E. R., Block 11, Mundubbera
Law, D. T., "Rossvill" Stud, Aspley
Lees, J. C., "Bridge View" Stud, Yandina
Ludwig & Sons, A. R., "Beau View" Stud, Beaudesert
O'Brien & Hichey, J., "Kildurham" Stud, Jandowae East
Orange, L. P., "Eula", Flagstone Creek
Pfrunder, P. L., Pozieres
Potter, A. J., Ascot, via Greenmount
"Tayfield" Stud, Taylor
Q.A.H.S. & College, Lawes
Regional Experimental Station, Hermitage
Rosenberger, N., "Nevrose", Wyreema
Rosenblatt, G., Rosevilla, Biloela
Schellback, B. A., "Redvilla" Stud, Kingaroy
Smyth, E. F., "Grandmere" Stud, Manyung, Murgon
Stark, H. L., "Florida" Stud, Kalbar
Thomas & Sons, F., "Rosevale" Stud, Laravale
Traves, G., "Wynwood" Stud, Oakey
Weier, V. F., "La Crescent", Clifton
Wolski, A., "Carramana", Warra
Young (Jnr.), W., Kybong, via Gympie

Large White

Assenbruck, C., Mundubbera
Barron Bros., "Chiltern Hill", Cooyar
Bell & Son, E. J., "Dorne", Chinchilla
Bishop, C. E., Beerwah
Butcher, Dr. B. J. & Parnwell, A. J., Plunkett, via Tamborine
Clark, L. D., Greens Creek, Gympie
Duncan, C. P., "Colley", Flagstone Creek
Fowler, S., "Kenstan", Pittsworth
Franke, H. J., "Delvue" Stud, Cawdor
Garawin Stud Farm Pty. Ltd., 657 Sandgate Rd., Clayfield
Gibbons, A. E. H., Mt. Glorious
Gibson, H., "Thistleton" Stud, Maleny
H. M. State Farm, Numinbah
Hall, M., "Milena" Stud, D'Aguilar
Heading, J. A., "Highfields", Murgon
Hickson, K. L., "Warra", Calliope
Horton, C. J., "Mannuem Brae" Stud, Mannuem, Kingaroy
Hutton, G., "Grajea" Stud, Cabarlah
Jensen, S., Rosevale, via Rosewood
Jones, K. B., "Cefn" Stud, Clifton
Kahler, J. & S., "Karajoy", East Nanango
Kanowski, A., "Exton", Pechey
Kennard, R. B., "Collar" Stud, Warwick
Larsen, H. L., "Oakway" Stud, Kingaroy
Law, D. T., "Rossvill" Stud, Aspley
Lees, J. C., "Bridge View", Yandina
Lobegeiger, L. C., "Bremer Valley" Stud, Moorang, via Rosewood
Mack, A. J., Mundubbera
Neilsen, L. R., "Sunny Hill," Ascot, via Greenmount
Neilsen, A. R., Ascot, via Greenmount
Palmer, V. P. & Son, "Remlap", Greenmount
Pampling, G., Watch Box Rd., Goomeri
Port Curtis Co-operative Dairy Association Ltd., Stud Piggery, Biloela
Postle, R., "Yaralla" Stud, Pittsworth
Powell, R. S., "Kybong", Gympie
Q.A.H.S. & College, Lawes
Radel, V. V., Coalstoun Lakes
Radel, R. M., Coalstoun Lakes
Regional Experimental Station, Biloela
Robinson, O. R. & O. J., "Linvale", Argoon, Biloela
Rosenblatt, G., Rosevilla, Biloela
Skyring, G. I., "Bellwood" Stud, via Goomeri
Stanton, H. R., "Tansey" Stud, via Goomeri
Stehn, L. W., "Hodgson Vale", via Toowoomba
Stewart, L., Mulgowie, via Laidley
Stumer, K. F., French's Creek, Boonah
Wharton, C. A., "Central Burnett" Stud, Gayndah
Wieland, L. C. & E., Lower Cressbrook, Toogoolawah
Zahnow, W., Rosevale, via Rosewood

Tamworth

Armstrong, H. J., "Alhambra", Crownthorpe, Murgon
Booth, J. D., Swan Creek, Warwick
Campbell, P. V., "Lawnhill" Stud, Lamington
Coller, R. H., Tallegalla, via Rosewood
Fletcher, A. C., "Myola" Stud, Jimbour
Herbst, L., "Hillbanside", Bahr Scrub, Beenleigh
Kanowski, S. E., "Miecho", Pinelands
Potter, N. R., "Actonvale" Stud, Wellcamp
Regional Experimental Station, Kairi
Salvation Army Training Home For Boys, "Canaan" Stud, Riverview
Skerman, D. F. L., "Waverley", Kaimkillenbun
Stephen, T., "Withcott" Stud, Helidon
Thomas & Sons, F., "Rosevale" Stud, Laravale
Wieland, L. C. & E., Lower Cressbrook, Toogoolawah

Wessex Saddleback

Ashwell, J., "Green Hill", Felton South
Cooper, G. J., Neumgua
Douglas, W., "Greylight" Stud, Goombungee
Dunlop, J. B., "Kunawyn", Acacia Rd., Kuraby
Kingsford, D., "San Antone", Toowoomba
Kruger & Sons, "Greyhurst" Stud, Goombungee
Law, D. E., "Homevale", Goombungie
Law, D. T., "Rossvill" Stud, Aspley
Mack, A. J., Mundubbera
Scott, A., Wanstead Stud, Grantham
Smith, C. R., "Belton Park", Nara
"Wattledale" Stud, 432 Beenleigh Rd., Sunnybank

Landrace

Crothers, B. M., "Booligar", Clifton
Duncan, C. P., "Colley", Flagstone Creek
Grayson, D. G., Killarney
Kath, E. E., "Topcamp", via Toowoomba
Kingsford, D., "San Antone", Toowoomba
Neilsen, A. R., Ascot, via Greenmount
Orange, L. P., "Eula", Flagstone Creek
Stehn, L. W., "Hodgson Vale", via Toowoomba

Large Black

Pointon, E., Goomburra

bucket and bail

Care of Glass Milk Pipes.—Glass pipe lines are becoming popular on modern milking machines. This use of these pipes has many advantages, but care must be exercised to prevent costly and inconvenient breakages. The following precautions should be observed:

Ensure that the pipe is firmly held in the joint. If this is not done any slight vibration, or bump, will knock the pipe onto the cement floor with consequent breakage.

Do not leave the in-line teat-cup holder hanging on the milk line during cleaning. (If one is available it should be in use on the teat cluster.) The sudden rise in temperature of the glass when boiling water is passed through the pipes for scalding purposes has been known to cause the glass to break at the point where the cold metal holder is hanging on the pipe. The risk of this happening is much greater in winter.

See that the pipe is given sufficient protection on the facia board to prevent it from being bumped with the cow's head or horns.

Take care with back chains when a cow is being let out of the milking shed. It only takes a flick with the chain to break the glass pipe.

Watch the handle of that yard broom. Carelessness in using the broom when scrubbing the milking shed floor has caused the breakage of glass milk pipes.

F. J. SLATTER, Dairy Adviser.

Herd Records and Farmers.—Each year, more and more dairy farmers are proving that the man who keeps herd records is in the best position to increase his profits. Records point unerringly to weaknesses in dairy herd breeding, feeding and management.

So much modern equipment is needed on a dairy farm that the investment per cow is high. This means that there's no place for low producers.

The Department's herd recording section offers farmers a service that will enable them to cull their lowest producers accurately. From the reports you will know the best cows to use for breeding herd replacements. The records will also prove the herd improving quality of your bull. Dairy farmers are urged to join a herd recording group without delay.

S. E. PEGG, Chief Herd Recording Adviser.

Get the Best from Your Dairy Heater.—Long life and trouble-free service from the dairy water heater are yours if only you take the common-sense precautions of caring for it and using it properly.

Soft water should always be used in a dairy heater. Bore waters usually corrode the metal and reduce the life of the heater. A steam sterilizer, fuelled with solid or liquid fuel must not be set up in the dairy as smoke and fumes may contaminate milk and cream.

When using steam to boil water, be sure the water is actually boiling before removing the steam hose. When the steam is turned on, the pressure will agitate the water and soon give a false impression that it's boiling. Don't be too hasty in removing the steam hose from the container.

—K. L. NORMAN, Dairy Adviser.

What The Fruit Grower Should Know About Quality And Maturity—II

By T. HOPE, Chemist, Horticulture Branch.

With the object of helping the grower to harvest his fruit in accordance with the regulations, maturity standards of fruit are defined and all the visible external indications of maturity are given.

Variations in both physical and chemical qualities occur in fruit from the same tree from season to season, and in fruit from different trees in the various growing areas. Consequently fruit tested for maturity must be harvested from selected trees in representative districts over a period of years. Work of this nature is naturally detailed and prolonged if a standard of maturity is to be established which will apply equally well to all districts. Chemical standards of maturity have been established for pineapples, citrus fruits, grapes, mangoes, and the Fuerte variety of avocado, and are incorporated in regulations prescribed for these fruits.

Maturity Standard for Pineapples

Under the regulations, pineapples harvested during the months October to March should contain at least a total soluble solids content of 12 per cent. and have a tinge of yellow colour at the base of the fruit.

During the months April to September, pineapples should contain at least a total soluble solids content of 10 per cent. and be not less than a quarter yellow colour at the base of the fruit.

It must be emphasised that these are minimum standards for the fresh fruit market. In some instances growers will find it desirable to delay harvesting until a little more colour than that prescribed has developed at the base of the fruit in order to ensure a fruit of high edible quality. Peculiarities in soil type, climate and cultural practices known only to the grower will largely influence him in his decision to harvest fruit with a content of yellow colour at the base greater than that prescribed.

Citrus

Physical and chemical determinations of maturity have been made on Navel, Joppa, Late Valencia, other oranges and mandarins.

Under the regulations, "mature" in relation to mandarins and oranges means that the fruit has the natural colour and palatability of tree-ripened fruit and is in such a condition that the quantity of deci-normal soda solution required to neutralise the acidity content of 10 millilitres of juice drawn from the mixed juices of a sample of not less than 10 fruits taken at random from any package or packages bearing a similar mark, shall be not more than 20 millilitres in the case of mandarins, 24 millilitres in the case of navel oranges, and 30 millilitres in the case of oranges other than navels.

"Mature" in relation to grapefruit means that the fruit has the natural colour and flavour of tree-ripened fruit.

"Juicy" in relation to oranges and mandarins means that the fruit has not less than 35 per cent. of juice by weight of the total weight of the fruit; "juicy" in relation to grapefruit and lemons means that the fruit has not less than 30 per cent. of juice by weight of the total weight of the fruit. The weight of the juice is obtained by rotating the halves of the freshly cut fruit on a conical glass lemon or orange squeezer under hand pressure only and straining the resultant juice through a strainer of not less than 30 meshes to the lineal inch. The sample from which the juice is extracted shall consist of not less than 10 fruits selected at random from a package or packages bearing a similar mark.

Citrus fruits do not ripen after picking; consequently fruit picked with an acidity in excess of that prescribed by the regulations will retain its high acidity and fail to pass laboratory tests. The same fruit, had it remained on the tree, would have lost a fairly constant amount of acidity each week and gained considerably in flavour, quality and aroma. It is therefore preferable to delay harvesting until the fruit has become sweet and palatable.

Some growers prefer to carry out their own chemical tests in order to ensure that the acidity of the juice is below the maximum value prescribed by the regulations. This is performed by combining the juice extracted from 10 or more fruits, measuring 10 millilitres into a conical flask, adding 100 millilitres of water and 2 drops of a 1 per cent. solution of phenolphthalein indicator. The deci-normal solution of caustic soda is then added gradually until a pink colour appears.

Provided the sample of fruit tested is truly representative of the fruit to be harvested, and the acidity is not above the prescribed maximum, fruit at the same stage of maturity as the sample tested may be harvested. As there are often wide variations in the acidities of fruits on the same trees and on different trees it is desirable that the acidity value should be slightly below the maximum prescribed in order to allow some margin for error.

Grapes

"Mature" in relation to grapes means sweet and palatable. In addition, the total soluble solids of the filtered juice of the grapes shall not be less than 16 degrees as measured by a Brix spindle at 20 deg. C. Grapes to be harvested should possess the uniformly good colour of the variety and be of good size. Small grapes are often immature and should be trimmed from the bunch. A grower recognises the mature colours of his varieties and when flavour is good it may be assumed that crops are suitable for harvesting. The grape can be tested by the grower by extracting the juice and determining the sugar content with a Brix spindle.

Avocadoes

The avocado does not soften readily until it it picked. Because visible indications of maturity are lacking while the fruit is on the tree, there is always a danger of premature harvesting. An avocado insufficiently mature when picked will shrivel and may rot whilst ripening. The flesh will also lack the nutty flavour of the mature fruit. After the green varieties have reached a certain stage of maturity there occurs a slight change of colour from green to a paler green, the stem changes to a yellowish colour and skin gloss is less pronounced. The green variety of avocado when picked at this stage of maturity will ripen without shrivelling and the flesh should have a good buttery flavour.

With coloured varieties, harvesting should commence when the stem turns yellow and the amount of purple or black colour is from one-quarter to one-third the total area of the skin. This will ensure the formation of the 50 per cent. black or purple colour prescribed by the regulations when the fruit arrives at the market.

For the green coloured Fuerte variety regulations prescribe an oil content of not less than 15 per cent.

Mangoes

During the early stages of growth the colour of the skin is usually dark green, but as the fruit approaches full size the skin on the cheek exposed to the light assumes a blush peculiar to the variety.

There are many varieties or races of mango, each assuming at maturity its own peculiar blush and ground colour which varies with environment. The grower of a particular variety must therefore be familiar with the characteristic ground colour and blush peculiar to the environment in order to harvest fruit which will withstand normal transport conditions and yet ripen satisfactorily to a fully mature flavour.

Prescribed maturity standards are as follows: Kensington Pride, a total soluble solids content of not less than 15 per cent.; for other varieties, a total soluble solids content of not less than 11 per cent.

During the fortnight before full maturity is attained the fruit increases in size rapidly. At the end of this stage the fruit may be removed readily from the stem and will ripen to a good mature flavour. Immature mangoes are difficult to pick and often the full length of stem remains attached to the fruit. Only when the fruit is almost mature do the abscission cells in the stem permit easy picking.

Maturity of Other Fruits

Fruits other than pineapples, citrus, grapes, mangoes and avocadoes have been the subject of detailed maturity studies but no suitable chemical index of maturity has yet been found. However, some observations made during the course of these investigations may assist the grower in the harvesting of his crop for the fresh fruit market.

Apples

As all apples on a tree do not mature at the same time, several pickings may be necessary. Probably the simplest way for the grower to assess maturity is by the change in ground colour. Dessert apples should not be picked for the fresh fruit market until the ground colour has changed from green to green yellow. At this stage the fruit is generally crisp, sweet and palatable.

Apricots

The earliest stage at which apricots may be picked is when the green colour of the skin assumes a pale yellow or straw colour.

Bananas

Bunches of bananas for harvesting should consist of mature, well-filled fruit devoid of any yellow colour. The fruit should be evenly rounded, the ribs scarcely visible and the skin light-green in colour. The remains of the flowers can be rubbed off readily by the fingers. Bananas maturing during winter to spring will split if allowed to become too full on the plants. Splitting is undesirable because the flesh ripens and becomes too soft for transport. A slight ribbed appearance is permissible during this period, but the fruit must not be thin and the green colour of the skin must not be too deep.

Cape Gooseberries

Cape gooseberries are usually harvested over a period of from three to six months after planting, depending upon conditions. The berries are mature when the colour of the husk has changed from green to pale brown. At this stage the fruit falls to the ground. It is better to pick the fruit from the ground than from the bush, as this ensures uniformity of colour and maturity. Ground picking should occur at regular intervals and each bush should be shaken during each picking in order to dislodge mature fruit.

Cherries

Cherries for the fresh fruit market should be firm, fully mature and well coloured. The skin of the dark-fleshed varieties should be fully coloured to a deep red. The skin of light-fleshed varieties should possess a creamy ground colour with a well developed red flush.

Custard Apples

The flesh of the custard apple which is allowed to mature on the tree is too soft for normal transport. Hence the fruit is harvested while still firm in texture but sufficiently advanced in maturity to ripen satisfactorily. The fruit is ready for harvesting when the fissures between the segments close, become curved and develop a lighter colour. Fruit picked too early fails to develop full flavour, becomes hard and develops an objectionable black colour.

Lemons

Lemons should be harvested at the stage known as "silvering," which occurs during the change in colour of the rind from dark green to pale yellow. Fruit allowed to remain on the tree until fully coloured becomes large and coarse and the flesh deteriorates in quality.

Pears

Pears should be harvested when the ground colour of the skin is changing from green to green-yellow. Pears harvested prematurely tend to shrivel and to ripen abnormally.

Papaws

There are two main harvesting periods in southern Queensland—April-June and September-November—although ripe fruit is generally available throughout most of the year. In tropical districts the main harvesting periods are somewhat extended.

Fruit for the local market should be picked at the half-yellow stage during the period April-September, and at a stage when the colour of the skin is changing from green to yellow during the period October-March.

Fruit for export to southern States should be harvested at an earlier stage of maturity than that for local markets. During the months October-March it is essential to have some tinge of yellow colour at the base of the fruit to ensure successful ripening and full maturity of flavour. During the months April-September the base of the fruit should be one-quarter to one-third coloured yellow for successful ripening and fully mature flavour.

Passion Fruit

Passion fruit should be harvested when at least three-quarters of the skin has acquired a purple tinge.

Peaches

During the few days prior to full maturity the peach increases rapidly in size and improves both in flavour and in colour. In the case of yellow-fleshed peaches the fruit is mature when the green commences to fade and is replaced by a yellow tinge. With white-fleshed varieties the green colour is replaced by a creamy tinge.

For local markets peaches may be picked after the green colour has faded but for distant markets a slight green colour is essential in order to avoid over-ripeness and injury during transit. The degree of firmness in the suture is a very good index of maturity.

Plums

In light-coloured varieties there is a marked change from the dull-green ground colour to yellowish green, then to yellow and finally to either brighter yellow or red, depending upon variety. Dark-coloured varieties change from green through greenish blue or reddish purple to dark blue or purple, depending upon variety. Development of full colour is accompanied by a softening of the flesh at the base of the fruit. At this stage picking should commence for local markets. For distant markets plums should be picked at the firm stage but slightly less than full colour.

Rockmelons

Rockmelons must be fully mature when harvested as the sugar content does not increase subsequently. In netted varieties full maturity is indicated when the fruit may be slipped from the stem by slight pressure of the thumb; this is known as the "full-slip" stage. In yellow varieties maturity is also indicated by some tinge of yellow colour in the green colour of the skin and development of strong aroma. A small crack also appears at the stem end of some fruits, whilst in others the crack may occur at the blossom end. For transit over short distances and local markets, rockmelons should be picked at this stage of maturity. For distant markets it is advisable to harvest at the slightly less mature or "half-slip" stage, when only part of the stem is dislodged cleanly from the fruit by slight thumb pressure.

Strawberries

Strawberries for the fresh-fruit market should be picked when at least three-quarters of the fruit is showing a pink or red colour. Daily pickings are usually necessary.

Tomatoes

Tomatoes never develop full colour if picked immature, and should be allowed to remain on the plant till green mature.

For distant markets only green mature fruits should be picked. Such fruits must be fully grown, glossy in the skin, pale-green in colour and the flesh around the seed of deep amber colour. More mature fruits may be picked for local markets.

Watermelons

Neither size nor colour is an indication of maturity in the watermelon, as the skin colour does not change with increasing maturity and some small fruits may mature before larger fruits. Experienced growers tap the fruit with the knuckles and listen for the hollow sound which indicates maturity. As the sound produced by tapping varies with variety at maturity, it is advisable to taste a few fruits after tapping in order to enable correlation of the hollow sound with mature flavour. Harvesting should then be based on this correlation. When harvesting, about two inches of the stem should be left on the fruit in order to minimise injury by stem-end rot.

Tuberculosis-Free Cattle Herds

(As at 1st June, 1960)

Aberdeen Angus

Crothers, G. H. & H. J., "Moorenbah", Dirranbandi
Elliott, A. G., "Ooraine", Dirranbandi
Mayne, W. H. C., "Gibraltar", Texas

A.I.S.

Cox, T. L. & L. M. J., Seafield Farm, Wallumbilla
Crookey, J., Arolla A.I.S. Stud, Fairview, Allora
Davis, W. D., "Wamba", Chinchilla
Dennis, L. R., Diamondvale A.I.S. Stud, Mundubbera
Edwards Bros., "Spring Valley" A.I.S. Stud, Kingaroy
Evans, E. G., Lauraven A.I.S. Stud, Maleny
Green, D. B., Deloraine A.I.S. Stud, Fairdale
Heading, C. A., "Wilga Plains", Maleny
Henry, Mrs. K., Greenmount
Henschell, W., "Yarranvale", Yarranlea
H. M. State Farm, Numinbah
Littleton, H. V., "Wongalea", Hillview, Crow's Nest
Marquardt, A. C. & C. R., "Cedar Valley", Wondai
McShane, A. H., Handford Road, Zillmere
Mears, G. S. & E., "Morden", M. S. 755 Toogoolawah
Moore, S. R., "Sunnyside", West Wooroolin
Neale, D. G., "Groveley", Greenmount
O'Sullivan, Con., "Navillus", Greenmount
Power, M. F., "Barfield", Kapaldo
Messrs. Mitchell and Mulcahy, Rosenthal
Queensland Agricultural High School & College, Lawes
Radel, R. R. & Sons, "Happy Valley", Coalstoun Lakes
Roche, C. K., Freestone, Warwick
Sanderson, W. H., "Sunlit Farm," Mulgildie
Schloss, C. J., "Shady Glen", Rocky Ck., Yarraman
Scott, M. E. & E., "Wattlebrae" A.I.S. Stud, Kingaroy
Scott, W. & A. G., "Walena" A.I.S. Stud, Blackbutt
Shelton, R. A. & N. K., "Vuegon" A.I.S. Stud, Hivesville, Murgon
Estate Sokoll, A. H., "Sunny Crest", Wondai
Sperling, G., "Kooravale", Kooralgin, Cooyar
Sullivan Bros., "Valera", Pittsworth
Sullivan, D., "Bantry", Pittsworth
Sullivan, F. B., "Fermanagh", Pittsworth
Thompson, W. H., "Alfavale", Nanango
Webster, A. H., "Millievale", Sabine, via Oakey
Wieland, A. W., "Milhaven", A.I.S. Stud, Milford, via Boonah

Ayrshire

Dudgeon, C. E. R., Marionville Ayrshire Stud, Landsborough
Dunn, T. F., "Alanbank", Gleneagle
Goddard, B., Inverell, Mt. Tyson, via Oakey
Holmes, L., "Benbecula", Yarranlea
Mathie, E. & Son, "Ainslie", Maleny
Scott, J. N., "Auchen Eden", Camp Mountain
Zerner, G. F. H., "Pineville", Pie Creek, Box 5, Post Office, Gympie

Friesian

Behrendorff, E. C., Inavale Friesian Stud, M.S. 786, Boonah
Macdonald, S. E. G., "Freshfields", Marburg
Naumann, C. H., "Yarrabine", Yarraman
Pender, D. J., Lytton Road, Lindum
Stumer, A. O., Brigalow, Boonah

Guernsey

Doss, W. H., Degilbo, via Biggenden
Fletcher, A. B., "Cossart Vale", Boonah
Holmes, C. D. (owner Holmes L. L.), "Springview", Yarraman
Johnson, G. L., "Old Cannindah", Monto
Miller, G., "Armagh Guernsey Stud", Armagh, M.S. 428, Grantham
Ruge, A. & Sons, "Woowoonga", via Biggenden
Scott, C., "Coralgrae", Din Din Rd., Nanango
Swendson, A. C., Coolabunia, Box 26, Kingaroy
Wissemann, R. J., "Robnea", Headington Hill, Clifton

Jersey

Beckingham, C., Trout's Rd., Everton Park
Birt, W. C. M., Pine Hill Jersey Stud, Gundiah
Borchert, Mrs. I. L. M., "Willowbank" Jersey Stud, Kingaroy
Burrows, R. N., Box 23, Wondai
Bygrave, P. J. L., The Craigan Farm, Aspley
Carpenter, J. W., Flagstone Ck., Helidon
Conochie, W. S. & Sons, "Brookland", Sherwood Rd., Sherwood
Crawford, R. J., Inverlaw, Kingaroy
Farm Home For Boys, Westbrook
Fowler, P. & Sons, "Northlea", Coalstoun Lakes
Harley, G., "Hopewell", M.S. 189, Kingaroy
H.M. State Farm, Palen Creek
Hutton, D. R., "Bellgrath", Cunningham, via Warwick
Johnson, H. G., Windsor Jersey Stud, Beaudesert
Lau, J. F., "Rosallen", Goombungee, Toowoomba
Matthews. E. A., "Yarradale", Yarraman
McCarthy, J. S., "Glen Erin". Greenmount, Toowoomba
Meier, L. E., "Ardath Stud", Boonah
Noone, A. M. & L. J., "Winbirra", Mt. Esk Pocket
Porter, F., Conondale
Q.A.H.S. & College, Lawes
Ralph, G. H., "Ryecome", Ravensbourne
Scott, Est. J. A., "Kiaora", Manumbar Rd., Nanango
Semgreen, A. L., "Tecoma", Coolabunia
Seymour, B. T., "Upwell" Jersey Stud, Mulgildie
Smith, J. A. & E. E., "Heatherlea" Jersey Stud, Chinchilla
Tatnell, W. T., Cedar Pocket, via Gympie
Toowoomba Mental Hospital, Willowburn
Verrall, F. W., "Coleburn", Walloon
Weldon Brothers, "Gleneden" Jersey Stud, Upper Yarraman

Poll Hereford

Anderson, J. H. & Sons, "Inverary", Yandilla
Hutton, D. R. & M. E., "Bellgrath", Cunningham, via Warwick
Maller, W., "Bore View", Pickanjinnie
Maller, W., "Bore View", Gowrie Junction
McCamley, E. W. G., "Eulogie Park", Dululu
Wilson & McDouall, Calliope Station, Calliope

Poll Shorthorn

Leonard, W. & Sons, Welltown, Goondiwindi
Yamburgan Pastoral Company, Noondoo

Caring For Young Citrus Trees

By V. C. BEAN, Adviser in Horticulture.

The future of citrus trees depends largely on the care and attention given to them during the first two years after they are established. Far too many good trees are lost in this critical period through mishaps of one kind or another and many of these losses are quite unnecessary.

Tree failure in newly established orchards can be due to several causes. Chief among these are an unsuitable soil, lack of water or plant foods and climatic hazards.

Soil Types

Citrus is a sub-tropical tree. Nevertheless, the crop is grown in all States of the Commonwealth and on a variety of soil types. This simply means that, with efficient management, minor disabilities in climate or soil are not necessarily obstacles to citrus production.

Nevertheless, it is not altogether an accident that commercial citrus orchards in Queensland are mainly centred in three districts—Gayndah, Maroochy and Howard. All have mild climates with annual rainfalls ranging from 30 in. at Gayndah to 70 in. at Nambour. The rainfall is not well distributed, however, and irrigation facilities are a necessity for consistent production from year to year.

Growers with irrigation facilities invariably show a preference for sandy loams or sands of considerable depth. In these soils, root development is good and tree growth is correspondingly vigorous in well-managed orchards.

The preference for such soils is a practical recognition of the fact that citrus trees cannot tolerate waterlogged conditions for any length of time. Such conditions are usually followed by root failure and tree decline.

Where irrigation facilities are absent or the amount of water for irrigation is limited, lack of soil moisture in spring or early summer can place citrus on the lighter types of soil under considerable stress. The after-effect of such stress is a heavy fruit drop. To offset this, growers who are unable to supply water to their trees prefer land with a more heavily-textured surface soil and a reasonably open subsoil.

Regardless of the texture of the surface soil, a compact clay at shallow depths would rule out any soil for citrus.

Establishing the Trees

Before planting begins, the soil will have been well cultivated, tree positions marked out according to the planting system selected by the grower and holes dug to receive the trees. When the trees reach the orchard, the packages should be opened under shade.

Trees are usually consigned bare-rooted from the nursery and it is standard practice for nurserymen to dip the roots in a clay "puddle" before packing as a precaution against drying out in transit. The clay film adhering to the roots of the trees when they arrive at the orchard must therefore be removed by sluicing the root

Plate 1

Young Citrus Tree Dug in Nursery. Note the straight stem and fibrous root system.

systems with water in a barrel or some similar container. After trimming any damaged roots, the trees will be ready for planting.

However, until they are actually planted, they must be covered with wet bags or kept moist in some other convenient way.

The planting operation is relatively simple. A mound of topsoil is placed in the bottom of the planting hole. The tree is set upright in the hole so that the stem is in the middle and the bud union about 6 in. above ground level.

A notched planting board helps in this operation.

Spread the lateral roots of the young tree over the mound of soil with the roots well spaced in their natural position. Soil is then carefully worked into the hole to cover the roots and hold the tree in position. When sufficient soil has been added to half-fill the hole, pour in about 1 gal. of water. Lift the tree slightly to offset any sinking which may have occurred when filling in, and allow the free water to drain away. Finally, top off the hole with additional soil and form a 3 ft. basin around each tree for post-planting irrigation.

Don't rush this planting job. Unless the soil is thoroughly worked among the roots of the young tree and watering is thorough, air pockets formed around the roots tend to delay re-establishment of the tree and an early setback of this kind can be serious.

Unless rain falls shortly after planting, the tree should be watered every few days during the first month. Young trees have only a limited root system and only a limited area of soil can be effectively exploited for moisture.

From then on, each tree should receive 8–10 gal. of water at intervals of approximately 3 weeks. Precise watering schedules, however, will vary with both the season and the soil type. Trees established in a sandy loam will need more water than those in a clay loam, and the water requirements of the tree will be greater in hot, dry weather than in cool, moist weather. It is sound practice, therefore, to use a probe at weekly intervals to check the moisture status of the soil around the trees. You will be surprised at the amount of information it gives.

Plate 2

Consignment of Citrus Trees Ready for Dispatch to the Orchard. The roots are trimmed and "puddled" before being packed in straw and hessian.

A straw or grass mulch around the tree helps o conserve moisture in the soil and reduces the rrigation commitment of the grower. Use such mulch by all means, but do not place it in osition before spring; mulches tend to increase he risk of frost injury in the winter months n some areas. Further, do not pile up the mulch round the stem; the bud union is the weakest oint of the tree and should be kept open to oth sun and air.

Most of the soils used for citrus are not nherently fertile and, even with adequate water, lant foods must be supplied. Fertilizer should ot be used in the planting hole itself; the risk f damage to the roots is considerable, paricularly if the grower has a liberal hand.

Spring applications of fertilizers are, however, worthwhile; they stimulate that early flush which is essential for most favourable growth during the season. A 8/10/8 or similar mixture can be used at the rate of 8 oz. per tree in the first year and 1 lb. in the second year.

Supplementary nitrogen can be supplied at other times of the year should the leaves show the yellow-leaf symptoms typically associated with a deficiency of this element.

Sunburn and Frost

Trees which receive insufficient water and plant foods tend to be unthrifty. Unthriftiness, however, does not necessarily involve the loss of trees. More important in this connection are sunburn and frost damage.

Sunburn occurs when trees with a limited amount of leaf growth encounter a spell of very hot weather. The damage shows up as bark lesions on the trunk and branches, followed by development of water shoots below the points of injury. Even if the tree is not killed outright, it is difficult to train subsequent growth into a balanced shape. In commercial practice, special precautions are seldom necessary. Growers should, however, use their secateurs sparingly on young trees. Well-foliaged young trees provide their own protection against sunburn injury.

On a well-sited orchard, frost damage in the major citrus districts is only likely to occur on relatively flat land where topographical features tend to bank up cold air around the trees. Injury to the tips of the young tree is of no great moment. Injury to the stem and branches can, however, be serious.

In sub-coastal districts particularly, it is wise to erect a frame with a screen of hessian or other material arranged tent-fashion around each tree and tied at the top. These are fitted before the onset of winter.

Thick paper or straw wraps round the trunks of the trees are a useful deterrent against pests such as hares which sometimes prove troublesome in a dry spring when green feed outside the orchard is in limited supply. Pests of this kind sometimes cause spectacular damage in newly established orchards.

Caring for young citrus trees is not a complicated business and many failures are the aftermath of neglect. Success in the orchard business, however, goes to the man who buys good trees and manages them efficiently after planting.

Bulk Handling Saves Cotton Grades

Bulk handling is helping central Queensland cotton growers to get higher ginnery grades for machine-picked crops, the Minister for Agriculture and Stock (Hon. O. O. Madsen, M.L.A.) said.

Bulk handling is something new in the Queensland cotton industry, though it is adopted widely in the United States. In this method, big trucks or semi-trailers pull right into the paddocks and load up to 16,000 lb. of loose cotton. It goes by road to the ginnery. Formerly all cotton was put into bales and railed to the ginnery. The bulk method is especially suitable for handling cotton harvested with mechanical pickers.

Main advantage of bulk handling is that the grade of machine-picked cotton does not deteriorate so much as it does in bales. Machine-picked cotton often contains excessive moisture and green leaf. The moisture causes the cotton to sweat when it is compressed in bales for long periods, and results in stained lint. Stained cotton goes into one of the spotted grades and brings a lower price. The interval between baling and emptying the bales at the ginnery is often as long as three weeks.

On the other hand, cotton handled in bulk is rarely compressed in the truck for longer than 24 hours before it is put through the cleaners at the ginnery. In this short time the grade is not affected. Even damp cotton is not compressed long enough to sweat excessively and little staining results.

Mr. Madsen said that even at this early stage of its development, bulk handling is somewhat cheaper than handling in bales. It is also reported that bulk handling reduces costs at the ginnery. Growers who handle their crops in bulk are given a rebate of about ⅓d. a lb. by the Cotton Marketing Board. This is compensation to cover the cost of rail freight which is normally paid by the board.

Chief difficulties in bulk handling at present are the slowness in loading the cotton in the paddock and unloading it at the ginnery. Altogether these delays may tie up a truck for 10 hours or more, adding to the cost of transport. A drop in transport costs can be expected to follow the development of methods to streamline loading and unloading.

Mycotic Dermatitis On Cattle

By O. H. BROOKS, Divisional Veterinary Officer.

When a germ (*Dermatophilus dermatonomus*) invades the hair follicles of cattle, it causes an exudate which forms a scab on the skin, matting the hair. When the scab is lifted, it leaves a raw bleeding surface.

These lesions are known as mycotic dermatitis and are found from time to time affecting beef and dairy cattle. In the case of the former, bulls appear to be more susceptible, whereas in the latter, heifers are more commonly affected.

The disease has been observed occasionally over the past 20 years, but seldom becomes serious. Although infectious, it is usual to find infection confined to individual animals. It would appear that where the disease is introduced by purchased stock, the germ does not spread rapidly.

Mycotic dermatitis requires a high humidity to remain active, hence the sporadic nature of outbreaks. Early lesions may be mistaken for those of the ringworm fungus which also invades the hair follicles of the skin.

The infection can become serious amongst a group of stud stock in preparation for showing, as they are confined to a relatively small area and remain in close contact for longer periods than range cattle.

Recognition

The first indication of the disease is a matting of the hair close to the skin. As the lesion develops, the scab gradually thickens until only the tips of the hair are showing through. Scabs may be up to ¾ in. thick, covering several square inches.

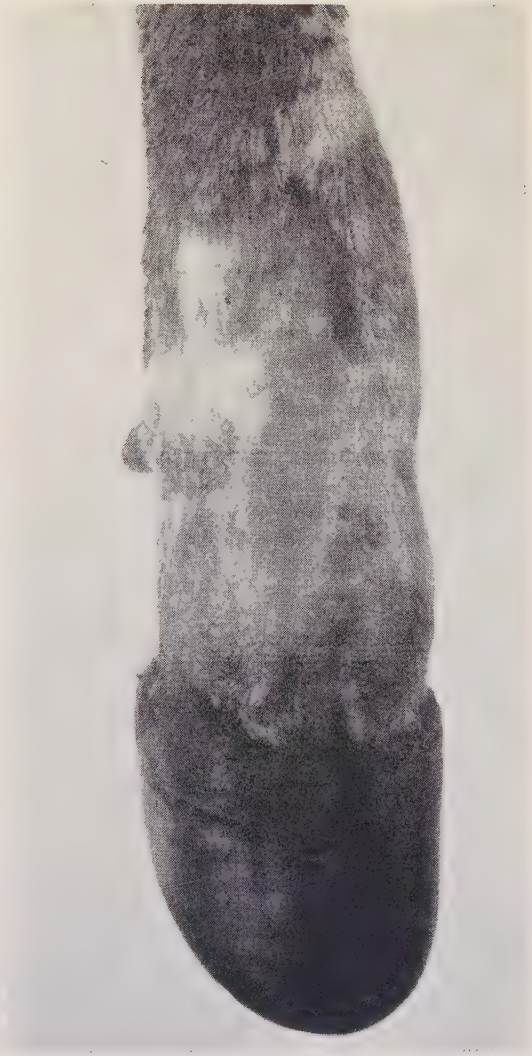

Plate 1

Foot Lesion Showing Thickening of the Skin and Granulations After Removal of Scab.

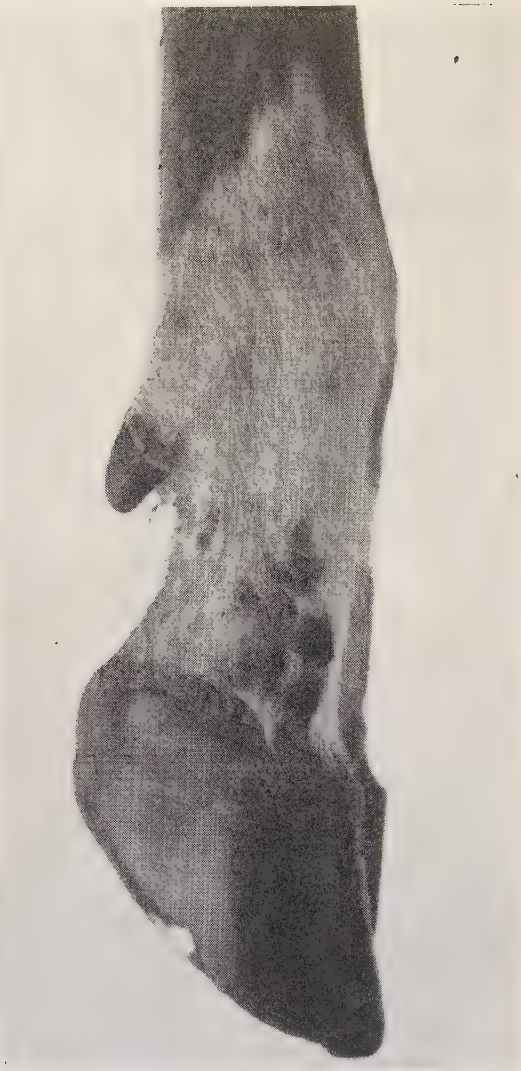

Plate 2

Foot Lesions Showing the Fissured, Encrusted Type of Scab.

As the lesion extends, the skin loses its flexibility and becomes stiffened. When the lesion extends over a considerable area, the scab can be seen through the hair as a "pie crust" formation. This is usually fissured and irregular.

Once the disease is established in the skin, it appears to spread rapidly. This may be due to spreading of the germ by rubbing.

Mycotic dermatitis is often mistaken for an unusual form of flattened warts which may spread over the body in a similar fashion. It can also be mistaken for ringworm which produces a scab and spreads by contact. A scab can be examined and should be forwarded to the Department for identification.

Affect on the Animal

Extensive lesions produce a hide-bound condition with scabs showing through the hair. The lesions irritate the animal, causing it to rub. This leads to breakaway of the scabs, leaving a raw bleeding surface. Secondary infection may lead to purlent discharges with a general thickening of the skin and fluid under the skin.

Death may follow a prolonged course of 6 to 12 months, during which animals become emaciated and hide-bound with an encrustation of scabs showing through long roughened hair.

It is common to find early lesions along the neck, back and near the pin bones. They spread along both sides, causing an encrustation which may form over the entire body. The affected animal becomes progressively weakened and may eventually die from starvation. Lesions on the legs may spread rapidly, causing a complete loss of hair. The skin becomes raw and thickened, and irritation may prevent the affected animal from grazing normally.

Treatment

The use of equal parts of tincture iodine and paraffin oil applied to the lesions daily has been effective. When the lesions are extensive, the use of potassium iodide by mouth, or sodium iodide by intravenous (jugular) injection, is more effective than local treatment.

For adult cattle, potassium iodide is given at the rate of 2 teaspoonfuls twice daily for 10 days or until symptoms of iodism appear. Iodine poisoning causes a loss of appetite, watering of the eyes, and drooling. It is not a serious condition because the symptoms soon disappear when the dosing is discontinued.

Sodium iodide solution is made by adding 2 oz. of sodium iodide to 1 pint of sterile (boiled) water. For adult stock, all this solution is njected into the jugular vein. As this method nay require some experience, it would be desirable to seek the assistance of a veterinary surgeon.

Copper solutions are also effective as a spray, and there are several copper compounds available. Copper sulphate (bluestone) is used as a 2 per cent. solution (1 oz. to 1 pint). If the lesions are extensive the treatment should be staggered to prevent copper poisoning from absorption.

Control

Isolation of animals affected by mycotic dermatitis is desirable, although seldom possible. Fortunately the germ is not highly infectious, as most animals have a natural resistance and lesions do not become extensive.

In the event of the disease becoming serious, spraying of posts and rails (where cattle rub) with lime sulphur (1:30) or copper sulphate (1:500) is recommended.

* * *

Farmers Ask About White Clover

Many inquiries concerning the use of White Clover have been received lately.

Answer: White clover is probably the most commonly used legume in permanent pastures growing in the temperate regions. In Queensland t has become naturalised in coastal paspalum pastures and its range extends well into the subropics. Under Queensland conditions it does best in irrigated pastures and grows mainly in he winter and early spring.

White clover is a perennial plant with a ather prostrate habit. There are several commercial strains having a more upright growth. Leaf stalks may reach a height of 3 to 18 in. depending on strain, soil type and climatic conditions. The flower heads are rather globular in shape, white in colour and are held upright.

The plant will thrive on a wide range of soil ypes provided its moisture requirements are net. It does better on loamy soils than on sandy or heavy clayey soils and tolerates some degree of acidity and though more tolerant than lucerne n this regard it does not succeed on acid soils. An application of superphosphate to acid soils vill assist growth.

The seed should be sown in the autumn at he rate of ½ to 2 lb. to the acre, depending on vhether it is sown in association with other egumes or is the only legume in the mixture. If are is not exercised in the managemennt of this egume it may cause bloating of stock, especially if the animals are allowed unrestricted grazing of the pasture in the lush season. The types of white clover usually grown in Queensland are New Zealand White, Irrigation White, Ladino White and Louisiana White.

Irrigated Pastures For The Southern Downs

In the article "Irrigated Pastures For The Southern Downs" which appeared in the April issue of the *Queensland Agricultural Journal,* the planting rates on page 249 were given in a manner that could possibly be misunderstood.

To remove any doubt about the rates, the recommendation is set out as follows:

2. Pasture mixtures recommended for the southern Darling Downs district where adequate water supplies are available:

		Per acre
(*a*)	Irrigation White Clover, Ladino White Clover	1 lb. each
	Phalaris tuberosa, Phalaris arundinacea	1½ lb. each
	H.1. Ryegrass	2–3 lb.
	Perennial Prairie Grass	2 lb.
(*b*)	Irrigation White Clover, Ladino White Clover	1 lb. each
	Phalaris tuberosa, Cocksfoot	3 lb. each
	H.1. or Perennial Ryegrass	2–3 lb.

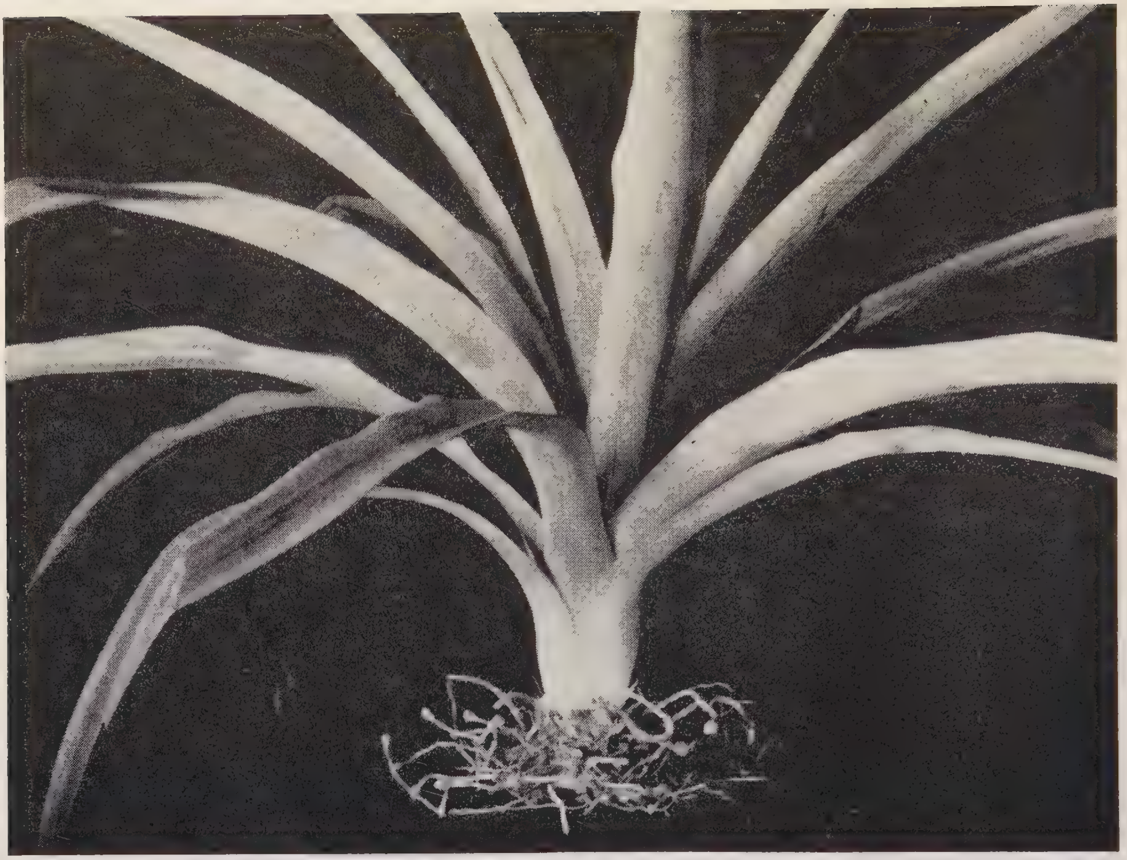

Plate 1: Eight-Month-Old Pineapple Plant Showing Heavy Root-Knot Nematode Infestation.

Nematode Control In Pineapples

By R. C. COLBRAN, Entomologist

A problem facing pineapple growers in Queensland is that of declining yields, and fewer ratoons on re-plant land. Recent investigations have shown that these conditions are frequently attributable to the nematode complex associated with the roots.

The important members of this complex are a root-knot nematode which produces root swellings, a root-lesion nematode which feeds within the root cortex, causing premature breakdown of the fibrous roots, and a spiral nematode which feeds externally, producing superficial lesions.

The result of nematode infestation is a root stem reduced in size and efficiency, a smaller ant and smaller fruit.

ONTROL:

Control of nematodes in pineapples can be hieved by injection of a suitable fumigant into e soil either before or after planting. The eatments are as follows:

) *Pre-plant Treatment*

Use either EDB (27 per cent. W/V or 12½ r cent. V/V)* or DD at the rate of 25 gal. the acre for overall treatment or 17 gal. to e acre for bed treatment.

In the overall treatment the fumigant is applied er the entire area in rows 1 ft. apart. In the d treatment, injections are made in four rows 1 ft. apart along each bed, leaving the interbed spaces untreated. In each instance the fumigant is applied at a depth of 6 to 9 in.

For effective fumigation:

(1) The soil should be well prepared, free of clods and undecomposed plant residues.

(2) The soil should be moist, not dry, particularly in the lighter soil types.

(3) The weather should not be extreme.

(4) A roller should be used immediately after treatment.

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* Use other formulations of EDB at equivalent rates.

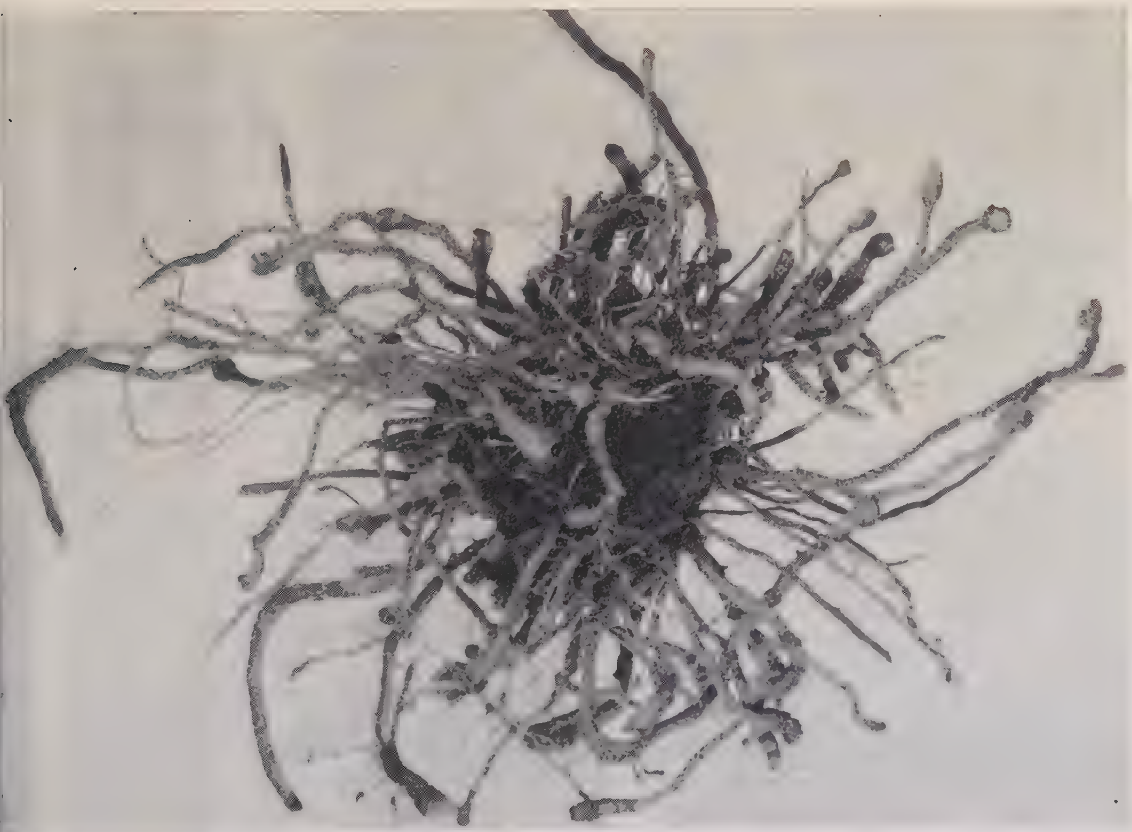


Plate 2

Pineapple Root System Infested with Root-Knot and Root-Lesion Nematodes.

The following points are pertinent when considering whether overall or bed treatment should be used:

(1) For overall treatment, land preparation and fumigation can be carried out many months prior to planting, provided no weeds are allowed to grow for more than three weeks in the intervening period. Fumigation can be carried out when conditions are suitable for maximum effectiveness.

(2) Bed treatment is less expensive. As growers bed up shortly before planting, a limited time is available for fumigation, and soil conditions may be unsuitable.

(*b*) *Treatment of Established Plants Less than Eight Months Old.*

Nematodes on or near the roots of pineapple plants can be controlled with "Nemagon" at the rate of 2 gal. to the acre as a bed treatment. For small areas the fumigant can be applied by hand injector between the plants in each row; for larger areas by machine injector down the middle of the bed. The depth of injection should be 6 to 9 in.

Pre-plant fumigation is more effective than fumigation after the plants have become established and infested with nematodes. Because considerable expense is involved and the nematode population in the soil could be insufficient to affect growth seriously, some growers may not be prepared to adopt pre-plant fumigation as a standard practice.

As an alternative, it is recommended that every fifth bed be treated with EDB or DD prior to planting. If a marked response occurs within six months, the remaining rows should be treated with "Nemagon."

WARNING

DD, EDB and "Nemagon" are poisonous to humans and animals, but are not dangerous when handled properly. Any unnecessary breathing of the fumes and contact with the skin should be avoided.

Scientific Names of Pests

The scientific names of the root-knot nematode, root-lesion nematode and spiral nematode referred to in this article are *Meloidogyne javanica* (Treub), *Pratylenchus brachyurus* (Godfrey) and *Helicotylenchus nannus* Steiner.

Wimmera Ryegrass

The expansion of irrigated pasture establishment has resulted in inquiries about Wimmera ryegrass (*Lolium subulatum*).

Answer: Wimmera ryegrass is widely used in fairly dry parts of the southern areas of Australia. In Queensland it is used to some degree in irrigated pasture mixtures.

This grass is an annual which produces very soft leaves and stems and may reach a height of 18 in. The stems are produced in spring and the plant dies following setting of seed. As it is a winter grower it does best under winter rainfall conditions, and on fertile soils, especially if the rainfall is small during its growing period. Whe grown under irrigation it may be expected t produce a good sward on a fair range of soi types.

Wimmera ryegrass should be planted in th autumn in a well-prepared seed bed. The rat of planting per acre varies from 4 lb. in mixture with legumes to 10 lb. as a pure stand. It is palatable grass but its nutritional level fall rapidly after maturity.

In order to insure regeneration it is necessar to close the paddock during the seed-settin period, after which the area may be graze safely again.

stock and station

Breeding Better Beef Cattle.—Performance recording offers Queensland graziers a ready neans of improving beef cattle quality.

Performance recording involves keeping ecords on the growth rate before weaning, the growth rate after weaning and conformation. n the main, the ability of a bull or a cow to ransmit its good qualities to its progeny can be gauged by its own performance. When performance records are kept, it's no longer necessary o wait for an animal to have offspring before it can be judged. This can speed up the rate of mprovement in a herd.

Performance recording is easy to apply in a herd and produces results sooner than progeny esting. It's effective in British breeds, Brahman cross cattle and Santa Gertrudis, and is being adopted by breeders of all these types.

—*G. I. ALEXANDER, Senior Cattle Husbandry Officer.*

Deaths of Water Birds.—Reports were received of deaths of native birds at Windera Station agoon in early February of this year. About 40 black ducks, 12 pelicans, a few eels and large numbers of fish (perch) were noticed dead around he edge of the lagoon.

It seems that excessive heat in late January killed the fish which were then eaten by the wild ducks and pelicans. Deaths ceased after heavy rains flooded the shallow lagoon, washing away he dead fish.

Botulism organisms in decomposing vegetable and animal matter have been responsible for mass killings of waterbirds elsewhere in Australia; this outbreak may have been due to this cause.

—*C. ROFF, Fauna Officer.*

Death Hid in Old Tins.—An old tin of poison dumped in a paddock recently cost a grazier 174 sheep before the cause of death was tracked down.

The grazier had cleared a number of old tins out of his woolshed and stacked them in a nearby horse paddock. The deaths occurred in two mobs of sheep that were held in the paddock some time later. Deaths were found to be due to arsenical poisoning, and the source of the arsenic was traced to one of the old tins. This had rusted through and the contents had leaked over the ground.

A loss like this is far too high a price to pay for the time it takes to dispose of poison containers safely. The containers should have been either buried or stacked in a fenced enclosure out of reach of sheep.

—*J. T. LITTLETON,* District Stock Inspector.

Three More Poultry Flocks Approved.—Three more Queensland poultry farmers have been granted approval on probation under the State's poultry improvement plan. Approval on probation is granted to breeders whose birds have reached qualifying standards for egg production and other factors of economic importance.

The farmers are Mr. George Lax, of Thornlands; Mrs. I. Rumball, of Mt. Gravatt; and Mr. George Loveday, of Peachester. Their flocks qualified in the 1959 random sample production trial.

The breeders recently approved will join Messrs. Walter Shale, of Hemmant; and Mr. Sidney Lingard, of Buderim, who qualified in the 1958 trial. The trials are carried out at the poultry section of the Agriculture Department's Rocklea Animal Husbandry Research Farm.

In the 1959 trial, average egg production showed a decided improvement on the results of the first trial in 1958. The production, 171 eggs a bird in the 48 weeks' laying period, was 11 eggs better than in the previous test. The top pen recorded an average of 186 eggs a bird and lowest 151.

The most profitable group in the trial returned £2 3s. 6½d. a bird over the cost of feed. However, this should not be accepted as the general level of profitability in the poultry industry. It does not take into account the cost of labour, depreciation of buildings, and other fixed costs. But it does indicate that a very reasonable profit can be made from a properly managed flock.

Deaths during the laying period were 8·75 per cent., showing a sharp drop from the 12·31 per cent. recorded in the previous trial. Between day-old and 18 weeks, when the pullets were moved into their permanent laying quarters, deaths were below 3 per cent. Although deaths during the laying period were low, leucosis in its various forms accounted for more than half of them.

Early maturity of the birds was another feature of the trial. The average age of the birds when the first egg was laid was 20 weeks. Most groups had reached 50 per cent. production by the 24th week.

—*A. L. CLAY, Director, Division of Animal Industry.*

Cutting a Ram's Horns in an All-Steel Race at "Verastan", Muttaburra.

Preventing Accidents On Farms

By J. R. WHITAKER,
a British Agricultural Engineer.

"Mercury" (Hobart) photo.

> *This is an extract from an article which first appeared in the "Journal and Proceedings of the Institution of British Agricultural Engineers" relating to accidents on farms, and methods of prevention.*

As you are all well aware, agriculture in Britain underwent a mechanical revolution between 1939–1949, and the spate of mechanisation is only now starting to tail off in this country. The result has been that virtually all machines have been designed without any thought at all for "safety" and in many cases quite simple modifications or guards would make a world of difference.

Had the Safety Act been law before mechanisation took place most of the machines at present on farms would be adequately guarded. This would have meant that right from the start new machines would have been introduced to workers and employers who were already beginning to be safety-conscious. An "awareness" that danger exists is the first and most important step in accident prevention.

If people could be persuaded to pause and think, many of the accidents against which we cannot legislate or guard could be prevented. The two points, greater care and better guarding, are the first lines of attack in the war on accidents.

Safety Regulations

The inherent danger of moving machinery and the potential danger of workplaces is being dealt with. Seven safety regulations have been published, although not all are in force yet, as time is being allowed to bring existing machinery into line and to alter production plans in respect of new equipment.

The following regulations are now in force:

(*a*) First-Aid Equipment, the amount varying according to the number of workers, must be provided by employers. The type and number of bandages, and so on, is specified in the regulations.

(*b*) Ladders must be soundly constructed, in good condition and properly used. Missing rungs or damaged rungs or stiles are an offence, and certain details of construction are required with wooden ladders.

(*c*) Children under 13 years of age are prohibited from driving or riding on tractors and almost all agricultural vehicles, implements and machines.

(*d*) Power Take Off. This regulation is not always fully understood. The tractor power-take-off—just the short splined shaft—must either be covered up or guarded from the top and both sides at all times when the engine is in motion. The shaft to the machine must, apart from certain special exceptions, be totally enclosed right up to the first fixed bearing on the machine. The main exception is for machines in use on February 1, 1959, but then only for shafts which throughout their whole length are entirely less than 2 ft. from the ground. In such circumstances these shafts must be guarded from the top and both sides by a guard which extends 2 in. below the lowest point of the shaft. There are very few of these inverted U-type guards which are deep enough.

The following regulations come into force on the date shown:

(*e*) Circular Saws. Top and bottom guards and rising knives of specific design and position will be required. Limits are placed on the age at which a worker can first use a saw, and training and supervision are required.

In operation from September 12, 1959—March, 1960.

(*f*) Safe Workplaces. In general, these require safe floors, hand-rails for staircases and guard-rails for openings in floors, edges of floors and pits in the ground. Covers or doors can replace the guard-rail in certain circumstances.

In force April, 1961.

(*g*) Stationary Machinery. Again, apart from special exceptions, guards will be required for the belts, pulleys, chains, cogs, gears and cranks of all machines designed for stationary operation.

In force July, 1961.

Causes and Prevention

The most important problem which we must tackle first is to obtain a reduction in the number of fatal accidents. It is probable that any measures, publicity campaigns or regulations which reduce fatal accidents will also reduce non-fatal ones. Very similar accidents can be anything from humorous to the onlooker to fatal to the participant. P.T.O. shafts have been known to tear a man's trousers off without injuring him, whilst a similar accident has killed another man.

Tractors are responsible for the biggest individual number of accidents. This could be partly a reflection of the fact that there are more tractors than any other machines, and that tractors are used for longer periods throughout the year. This can lead to misleading assumptions.

A report on accidents in the Eastern Counties showed that roughly there were:—

	Accidents Rate
15 Tractor accidents from 26,000 machines . .	1 per 1,800
and 5 Baler accidents from 1,350 machines	1 per 300

The baler, therefore, is a greater hazard—six times as great—and because it has a short season of use it is even more dangerous, or so the report appeared to evaluate the figures.

But we are not concerned with hazards related to accident rates. Farms are equipped with a given range of machinery in numbers that will not change very greatly, and if tractors are involved in 15 accidents and balers in 5, then tractors are three times as dangerous as balers, and tractors must be our first consideration.

Then having blamed the baler as a machine, the report later states that in each case that had been considered the accident was due to the failure of the operator to stop the machine before making adjustments—so surely there is some contributory negligence. It goes on to state that the fitting of additional guards would serve no useful purpose, as these would have to be removed before adjustment could be made.

I do not agree with this. On many balers there are several points which could be better guarded—belt drive, main crank, P.T.O. flywheel and needles; and if the guard has to be removed for adjustment it must only be when the machine is stationary. In any case, the presence of and need to remove a guard will be a reminder of the danger.

Is It Negligence?

Negligence is, perhaps, too condemnatory a word. It implies knowledge of the precaution which should or could be taken, and in many cases lack of instruction or training is the root of the trouble.

Speed, plus sharp turns, uneven brakes with a heavy trailer load, or bumpy ground are the causes of overturning. Any one of these on its own may not cause an accident, but two of them taken together add up to an overturned tractor and an injured or killed driver.

It is not often the man who is taking a risk and looking for danger points who has the accident; it is more often than not the routine job—apparently safe—done with a little less care or under slightly changed conditions which results in the accident.

The manufacturers do what they can, though I don't think it is enough. Instruction books warn against high speeds, sharp turns, and so on, and I am sure, too, that dealers and salesmen when supplying tractors warn users of the dangers, but it does seem unfortunately true that memories are short and that a continuous campaign is necessary to make any appreciable impression.

It is better to have an idea knocked into a man's skull than his skull knocked in by an overturned tractor.

The first of the new series of farm safety leaflets deals with tractors overturning; we hope that the rather unpleasant picture on the front will have a deeper and more lasting effect than written exhortation.

Falls from tractors account for nearly as many deaths as all implement and field machinery accidents, and a large proportion of those who fall are passengers, including children who should not be there. If the Children's Regulation is complied with, it should reduce the deaths of children, due to accidents in agriculture, by at least a third.

So far as other passengers are concerned, opinion is divided. There is some suggestion that if a proper seat were provided it would be the best solution, and whilst I sympathise with the people who would like this, I cannot support it—mainly, I admit, because one tractor which provided a seat which could accommodate two people had its controls so positioned that with two people on the seat neither could properly control the tractor.

Many people carry loose on tractors a miscellany of tools, oil-can, coats and gadgets which can and often do interfere with the controls, and so contribute to an accident. I would plead for a large toolbox, with a separate compartment for drawbar pin, D, links, and so on, and perhaps even a separate box for lunch kit and flask.

Greater Care Needed

The circumstances which cause many accidents are generally simple—identical with what many of us here have done in the past and may do again in the future, although we hope without serious result.

In one case of a tractor overturning when turning from a steep farm lane into a field, to which there were no witnesses, clear tyre tracks showed the course that had been attempted, and my own opinion was that the tractor should have got round quite safely. I would willingly have tried to drive a tractor round—but the accident happened. Possibly, just at the wrong moment the driver wasn't concentrating.

A non-fatal accident, involving a ram-type pick-up baler, occurred when the operator fed several bales which had only been tied with one band back on to the pick-up. One of the tied strings caught round his ankle and his leg was severely injured by the pick-up which had picked up the tied string.

Simple in their occurrence, impossible to legislate against, yet they would have been prevented by taking greater care, and the latter certainly reduced in severity if the baler had had a guard rail in front of the pick-up which the operator could have grasped.

There are many similar examples which could be quoted. In the main, these accidents can be prevented by greater care and thought by the people concerned, but they will only take heed if everyone concerned, in season and out, keeps reminding them.

Adequate Guards

The other type of accident where the machine is the main cause will be prevented by adequate guarding. We can look forward to the fitting of more guards in the very near future.

In so far as these guards will act as a reminder of danger, they may help general accident prevention by keeping people aware of the need to take a little more care at all times.

Many of the accidents happen because operators carry out servicing and maintenance whilst the machinery is in motion. It may not be possible or necessary to prevent this, but in every case revolving shafts and belts should be so protected that the worker is not endangered.

Normal servicing and maintenance should be done with machinery stationary, particularly if guards have been removed. Instructions to that effect could be given by every employer. If servicing has to be done to moving machinery with a guard removed, then a responsible person should be detailed to do it after having been given full instruction. This, however, should be exceptional.

Ideally, guards should be arranged so that the machine must be stopped and cannot be re-started until the guard is replaced (as is the case with many machines in factories). This would mean complicated guards and involved inter-locking arrangements for much equipment, and it is obviously too onerous a requirement for every situation.

On the other hand, if machinery can be run without its proper guards, greater emphasis must be placed on requiring guards to be fitted and kept in place by both employer and worker.

It should be accepted that an employer is responsible for giving or having given training and instructions to every employee, not just on the requirements of the Act or Regulation, but on the reason why a guard is there and the danger of its removal.

It is possible that those accidents associated with the maintenance of machinery, particularly when it is in motion, will be reduced by the introduction of self-lubricating bearings. A small reduction, perhaps, but important in that it allows greater emphasis to be laid on the remaining causes.

Similarly, other trends of modernisation can lead to safer working conditions. The overhead shaft driving a multiplicity of machines with flat, unguarded belts is being replaced by individual electric motors with short drives which can easily be guarded. The big danger here is faulty electrical installation.

Electricity can be the most dangerous power unit on the farm; I say can be—it need not. Provided it is installed according to the regulations it will be safe, but deterioration can and will occur. Regular inspections and tests by a suitably qualified electrician will show up faults before they can result in danger.

It is on the probable need for guards on existing machinery that the trade generally will have an opportunity to introduce the question of accident prevention and, it is to be hoped that they will use the opportunity not merely to sell the required guard, but to sell the idea of being accident conscious.

As you can see from the figures, it is not sufficient to guard machinery—or even to guard against bulls; people must be protected from themselves by the only method we have—propaganda.

I am certain that most farmers and farm workers know of most of the dangers which are met with around the farm, but like us all, they are not often consciously aware of the danger. If they are, they probably think—"Well, it won't happen to me". This in spite of the fact one worker in twenty has an accident every year—some not very serious, but others leading to incapacity and perhaps death.

Comparison With Industry

A comparison with the situation in industry may be both useful and interesting.

Factories have a lead of many years on agriculture in the field of safety and accident prevention activity, and we should not hesitate to use any of their ideas which could speed the reduction of agricultural accidents.

I would like to quote figures, opinions and suggestions from a report of the Industrial Safety Sub-Committee on Industrial Accident Prevention. Their conclusion applies to farming equally as much as to industry.

In industry, accidents have been reduced from 30 per 1,000 workers in 1937 to 22 per 1,000 in 1954. One very disturbing factor when these figures are broken down into age and sex groups is that the accidents rate for men and boys is similar, 28·9 per 1,000 and 29·6 per 1,000, although it is reasonable to suppose that boys under 18 are generally employed on less hazardous work, and that women and girls also have similar rates, 10·0 per 1,000 and 11·5 per 1,000, which are very much less.

A breakdown of the figures into causes shows that only one in six accidents can be attributed to power-driven machinery, in spite of the popular belief that machinery is dangerous. (By comparison, 50 per cent. of the fatal accidents in agriculture are due to machinery.)

Industry itself realises that this popular misconception must be uprooted if any appreciable reduction is to be made in accident rates. Unless everyone can be made to accept, and fully realise, the fact that it is some failure of the human element—the momentary abstraction which causes most accidents—there will be no progress. The drive and enthusiasm must come from the top, and must be continually renewed from that source. The employer or manager must feel it is his job to keep the works free from accidents.

The report suggests six principles of accident prevention:—

1. Accident prevention is an essential part of good management and good workmanship.
2. Management and workers must co-operate wholeheartedly in securing freedom from accidents.
3. Top management must take the lead in organising safety in the works.
4. There must be a definite and known safety policy in each workplace.
5. The organisation and resources necessary to carry out the policy must exist.
6. The best available knowledge and methods must be applied.

I am certain that these can also apply in principle to farms.

To Sum Up

The problem is a high accident rate, approximately double that for industry; the need is to reduce it.

Those concerned are employers and employees, manufacturers and dealers, and the safety inspectorate.

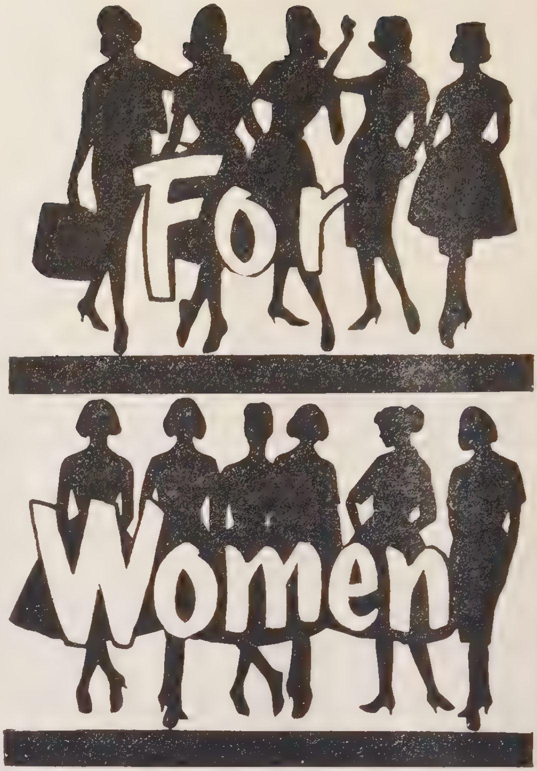
Each has a specific job, but all must co-operate on some jobs. The manufacturer can design new machines with greater safeguards; the dealer can supply and fit guards to existing hazards, which have, we hope, been pointed out by both employer and employee; but unless there exists constant reminder by all concerned to "think safety" all the time, we will only progress slowly.

The Safety Inspector, in co-operation with all the other people concerned, has to ensure that the proper guards are fitted, and to endeavour to see that everyone knows the need and reason for both guards and greater care.

Botany For Farmers

Although compiled in the first place for beekeepers, "The Honey Flora of South-Eastern Queensland" has a use for farmers and others interested in botany. It contains illustrations and descriptions of the important ironbarks, gums, bloodwoods, boxes, stringybarks, wattles, tea-trees, and cultivated plants such as lucerne, pumpkins, oranges and clover.

"The Honey Flora of South-Eastern Queensland" contains 199 pages and 178 illustrations. Prices are: In Queensland 15s. a copy, with a 3s. discount to registered apiarists, University botany students and booksellers; elsewhere £1 a copy.



When Buying a Suit

Irrespective of style, finish, fabric and cost, an ill-fitting garment is a poor buy.

This is particularly true of suits.

Here are some points to check on before buying a suit.

Try the suit on over the type of clothing you'll be wearing underneath it.

Look at yourself from the front, back and sides in a full-length mirror. See how the garment looks and feels in action—as you walk, sit, bend and reach for something.

A suit jacket should fit comfortably throughout, with the collar holding up close to the neck at back and sides and the shoulder line straight from the neck to the highest point of the sleeve.

The grain of the cloth ought to hang straight at the centre front and run crosswise around body and sleeves at bust level. Darts in the jacket should be directed to the bust.

Sleeves must be roomy enough for clothing to be worn underneath, with elbow-ease provided in the cut. Bend elbows to make sure this ease is where it will function properly.

A long sleeve should reach the wrist-bone as you touch the lobe of your ear on the same side.

The curve of lengthwise seams in jackets or fitted coats is best if carried slightly below the natural waistline. The jacket should fasten without strain.

Be certain that the bottom of the jacket does not come exactly half-way between the shoulder line and the lower edge of the skirt. The lower edge of the jacket of a classic style suit should run straight around the figure at an even distance from the floor.

Ease of walking in a skirt avoids strain at seams, and discomfort.

There should be enough sitting room to prevent both strain and crosswise wrinkles, to keep the skirt from pulling up too short when you sit, and to prevent cupping under.

In a well-fitting skirt the waistband fits snugly to the figure and holds the skirt in place.

The skirt should be smooth at the hips and allow extra ease at the fullest part of the hips—the side fastening should lie flat and be smooth.

The lengthwise grain of the skirt hangs straight at the centre front and centre back, while the crosswise grain runs straight around the figure at hip level in all straight-cut skirts.

Check to see that the back hangs straight with no cupping under the seat. The lower edge of the skirt must be straight and an even distance from the floor.

Select Fabric to Reduce Sewing Time

Irrespective of whether you like to make your own clothes, or not, the time in which to do so is not always available.

One way of cutting down on time is to select the material with the facts in mind:

- Firm and closely woven fabrics are easy to cut out, and can often take a finger crease which reduces trips to the ironing board. Many firm, closely-woven fabrics do not pay and seams need less finishing.
- Plain colours, all-over prints or *small* woven checks or stripes are quicker to cut out and put together than larger plaids or stripes that need so much time when cutting and putting together to ensure matching of stripe or check.
- Plain or all-over designs are better than one way designs as less time is required to lay out pattern pieces.

Avoid—

- Slippery fabrics which take longer to cut out because they twist and slip, and need more careful basting to ensure accurate final stitching.
- Loosely woven fabrics on which more time has to be spent in seam finishing to prevent fraying.
- Materials which are hard to sew, to handle and to press such as the *very* closely woven ones which are harsh and stiff; some with finishes through which it is difficult to push the needle; some of the newer synthetics which require special care of one kind or another; and also pile fabrics which need careful tacking to prevent the fabric slipping as it is being stitched.
- Material that requires straightening before cutting.
- Material that requires pre-shrinking.

Filling for Cushions

Bright cushions are a popular method of introducing colour to our surroundings but it is desirable that they be as good to use as to look at.

Much of this will depend on the filling used, and today there is a variety of filling material from which to choose.

It is well to remember that the comfort of a cushion rests on the quality, as much as on the type of filling used.

A cushion which is packed too tightly has only a limited use, and one which is too loose is unattractive because it cannot hold its shape.

Decide whether the cushion is to be for use and ornament, or ornament only, remembering that both needs can be met in the one cushion.

Foam rubber or plastic is available in a variety of types, some softer than others; it may be in one piece, chopped, or crumbled. The crumbled type tends to disintegrate with use, and in addition, needs to be covered with a smooth foam-type material to prevent the granular feel and appearance caused by the pieces.

Down or duck feathers make a cosy cushion which will last well.

Kapok will compress in time but is cheaper than down or duck feathers.

Soda for Safety

So often it is the simplest thing than can prevent a serious, or perhaps disastrous, happening.

The serious happening may be a small indoor fire—and the simple remedy in this case is ordinary bi-carbonate or baking soda.

Ordinary baking soda will make a simple fire extinguisher for small grease or paper fires that may occur, particularly in the kitchen.

An added advantage of this simple remedy is that the soda can be handled easily and safely by children.

A wise precaution would be to keep a packet in a handy place and be sure everyone knows where it is.

Show it to the children and show them how to use it, so that valuable time will not be wasted if a small fire starts when they are alone.

Keeping Copper Bright

The beauty and warmth of copper has made it a popular metal for household articles and furnishing accessories, but owners sometimes wonder whether the labour involved in maintaining its lovely sheen and glow does not dim the joy of ownership.

The reason for this is that copper is quickly affected by moisture and so loses its glow. Tarnishing is also a problem.

The following treatment should result in a longer period between polishings:

Clean, dry and polish well, then apply a thin coat of shellac, which is obtainable from the paint store.

This will keep the moisture and air from the metal and so it will not tarnish as quickly.

In time, however, it will crack and peel.

When this happens wash it in warm, soapy water, dry thoroughly, repolish and relacquer.

Should the lacquer become dull, polish with a very little furniture cream.

The shellac treatment would be of no use for kettles, saucepans and utensils used in the preparation of meals.

Heating would crack and chip the lacquer the first time the article was used.

The only suggestion to prevent tarnishing of these items is that they be kept thoroughly clean and dry, polished weekly, and stored in a dry place.

Gifts For The Sick.—Deciding on a gift for a sick friend is not always easy, particularly if one wishes the gift to be attractive and useful.

Miss Nancy Foskett, Senior Extension Officer, Women's Service, N.S.W. Department of Agriculture, has jotted down some ideas which she hopes will help both giver and receiver.

Flowers—although popular are not always the wisest [illegible] they often wilt quickly, staff are too busy to give them the correct attention, or there may not be anywhere to put yet another vase.

Nevertheless there *are* times when flowers are the right, and wanted, gift and when this is so the donor who brings them already arranged in a heavy-based container adds much to the gift. Where space is limited, or breezes treacherous, the small posy set in damp moss (which can be kept moist) will often give pleasure without anxiety.

If there is a suitable spot, a tiny pot plant or a bowl planted with bulbs about to flower is preferable to flowers.

Books and magazines are generally very acceptable if chosen to suit the invalid's taste or, alternatively, to introduce them to a new interest.

Paper backed books are light to hold—but be sure the print is easy to read—large and clear.

A bookmark will also be appreciated.

Handkerchiefs—remembering how hard it is to find that "nice white" handkerchief amongst the bedclothes, give coloured ones—or coloured tissues—they show up and are easily found.

Notepaper and a ballpoint pen or a soft, dark pencil, will be welcome to the convalescent—and if you include a book of stamps your gift will be more than doubly appreciated. Vary the notepaper from small cards, to notelets, and the usual writing paper. A few letter cards could be handy.

Toilet accessories and preparations are usually accepted with pleasure—especially if they're likely to boost the morale. A convalescent woman friend has time to pamper herself, and so would appreciate cleansing and skin creams and tonics, and hand care products.

A box of paper hand towels (although not easy to find) would have many uses.

Miscellaneous—fruit knife, a torch, a fan, pack of cards, a book of crossword puzzles for the convalescent enthusiast, some extra face washers, a vacuum tumbler that keeps cold drinks cold, a pair of mittens for winter patients who are well enough to hold a book or the paper.

Whatever the gift, try to be as original as possible (without losing sight of use and need), and bear in mind that gifts which help the patient to be independent of others, and relieve the tedium of long hours in bed are the welcome gifts.

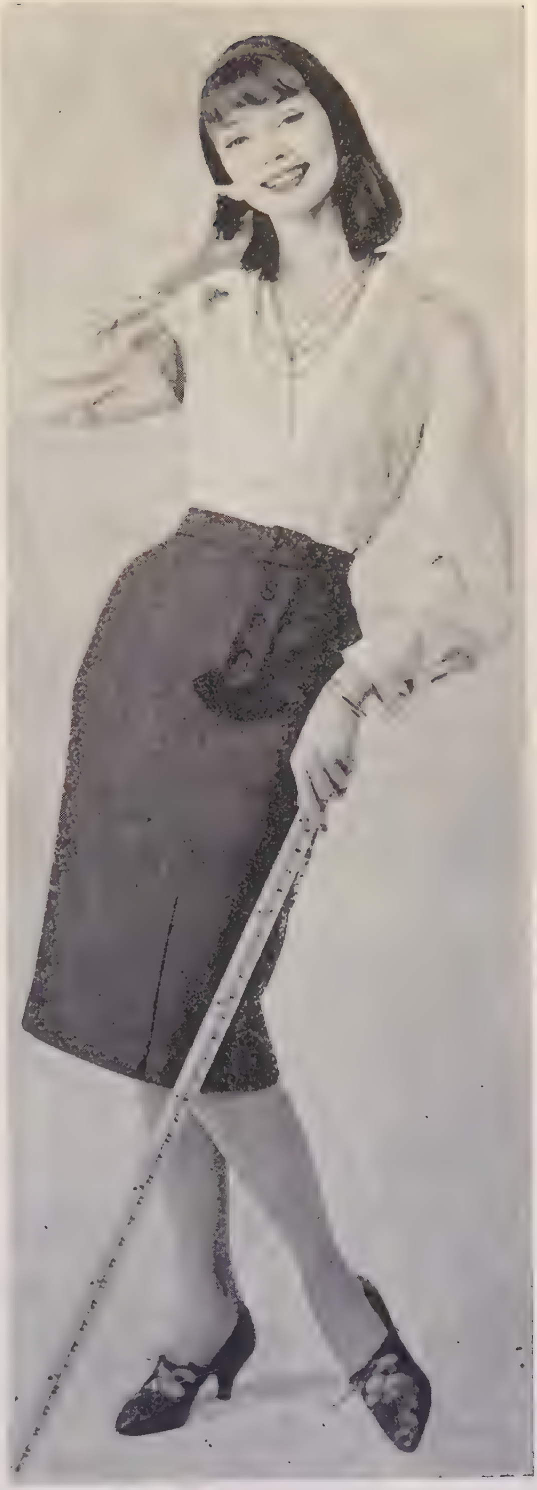
—From the New South Wales Department of Agriculture's "Press Copy."

Make It Yourself . . . . .

With winter here, now is the time to take a second look at those attractive woollen remnants you just couldn't resist at the sales. Some will be sufficient to transform into smart skirts and blouses.

Shown here is an outfit easy enough for any beginner to make. The skirt (Simplicity Pattern 3114) takes one yard of 54-in. fabric and would look fine in a soft flannel, a hard wearing worsted or one of the attractive woollen boucles. The pattern is cut in waist sizes 23½ in. to 28 in.

The blouse (pattern 3117) is also in the simple-to-make range. A fine plain crease-resisting wool or one of the many attractive prints is ideal for this. It is cut in sizes 10-18. For sizes 14 (34-in. bust) one-and-a-half yards of 54-in. wool is needed.



In Wool Competition

Miss Patricia Lockitt, an Entrant in the Wool Princess Competition, was Sponsored by the Toowoomba Apex Club. She is on the staff of the Agriculture Department, working in the Division of Dairying. Miss Lockitt's hobbies are squash, tennis, amateur theatricals, surfing and water skiing. She is treasurer of the Women's Squash Rackets Association of Toowoomba.

Take These Steps To Foot Health

The old proverb which starts—

> "I had no shoes and I complained . . . "

could be fittingly ended thus—

> " . . . until I found that I had healthier feet."

Without doubt, shoes are the main cause of painful, and often, deformed feet.

The fact that so many adult feet are misshapen parodies of what Nature intended is due to the adult having worn in the past ill-fitting footwear.

So to the main steps toward foot health—

Choose the Right Shoes

- Everyone's shoes should be LONGER than the feet (more so in the case of children).
- Shoes should be WIDE enough to ensure that toes are never squeezed.
- Shoes should be HIGH enough never to press on the toenails.
- Shoes bearing the wearer's weight should not be stretched anywhere. If so, they are too small.
- Shoes should be almost STRAIGHT down the inside. If not, the big toe is squeezed across, often causing bunions.

Shoes should never "be broken in." This means breaking in the foot to fit the shoe, one of the main causes of foot troubles.

Tight socks and stockings, especially on children, can do a lot to damage feet.

Insist on an easy fit, and change socks and stockings often, laundering them in a manner that will keep them soft.

Feet thrive on exercise. Spend a few minutes each day strengthening the toes. Walk on the toes; try picking up small objects from the floor; stand on a book and curl your toes over the edge.

After the day's work, give your feet a change to the comfort of wide, roomy soft slippers. But keep slippers for after hours. They are not designed to support feet through the working day.

Follow frequent bathing with a brisk rub with a rough towel. For a real foot tonic, use the contrast of warm and cold water. Always wash and dry thoroughly between the toes.

Common Foot Troubles

Now let us look at some of the common foot troubles and what can be done about them.

There are two arches in the foot. One is along the foot, and most marked at the instep. The other is across the front of the foot—the pad. If this one is fallen, callouses develop, and you should seek advice from your doctor.

The long arch is the one which most commonly falls, and this is called flat foot. The most common cause is the ankle "going over," and this pushes the arch down.

Exercises will strengthen the muscles, but if the ankle is over, the heel, and perhaps the sole of the shoe should be raised on the inner side, after advice from your doctor. Of course, this cannot be done on a high-heeled shoe because it would be too unsteady. Arch supports are of very little use unless the heel is so raised, but may help them.

Corns are caused by tight shoes that pinch or create friction. The pain of corns can be relieved by medication and cutting. But never try home surgery. Let your doctor be your guide. The cutting cannot cure the corn. Only correct shoes will do this.

The first thing to do about a bunion is to wear roomier shoes. If there is still pain, or if the bunion is so big that no normally-shaped shoe can be worn, surgery can be very satisfactory.

Ingrown toenails are caused by the nail being forced into the flesh by narrow or short shoes or socks. To diminish the effects of this, cut the toenails straight across and not too short, and wear roomier shoes and socks.

Your choice of shoes for your children in their growing years can make or mar their feet.

—*Queensland Health Education Council.*

Overcoming White Spear And Yabila Grass Problems

By W. J. BISSET, Agrostologist.

A system of cultivation in the case of white spear grass and judicious burning and spelling in the case of Yabila grass are ways in which the problems set up by these two grasses in the Central Highlands can be dealt with.

The native pastures of the open blacksoil downs of the Central Highlands are normally dominated by Queensland blue grass (*Dichanthium* spp.). Such pastures are highly regarded as stock feed over the summer months. In addition to the blue grass there are variable proportions of other good grasses and often considerable amounts of edible native legume species of which "Peak Downs clover" (*Glycine tomentosa*) is perhaps the best known.

Two other grasses present in these pastures are also important to the grazier but in a different way. These are white spear grass (*Aristida leptopoda*) and Yabila grass (*Panicum queenslandicum*).

Yabila grass is commonly known by various names such as star, umbrella, windmill, and blow-away grass. However, these names are rather loosely applied in western Queensland to grasses having a spreading seedhead which breaks off at the base and blows away. The name Yabila, which is considered to be a genuine local aboriginal name for this grass, is therefore preferable to these others.

Both white spear and Yabila grasses are extremely unpalatable to stock. In addition, white spear grass is a serious pest of sheep during its seeding period (summer and autumn). The seed can penetrate the wool, skin, and even the flesh.

Normally these two pest grasses are present in minor quantities only. Under certain conditions, however, they can increase considerably at the expense of blue grass until the pasture is dominated by one or the other or even both of them.

Reasons for Prevalence

A native pasture in which white spear grass and/or Yabila grass is dominant is regarded as degraded (a botanical term indicating a reversion to a more primitive type). It so happens in this case that the degraded botanical condition is reflected in reduced economic value of the pasture.

What are the causes of this degraded pasture condition?

Observations by pasture specialists over a number of years have shown that although seasonal conditions can have an important bearing the main factor underlying this degraded condition of Central Highlands blue grass pastures is wrong management.

Management.—The introduction of stock in the form of sheep to this region by the first white settlers about 1854 began a new era for these native grasslands which had previously supported only limited numbers of marsupials and birds. The pastoralists soon found that normal seasonal changes in pasture productivity raised problems in management.

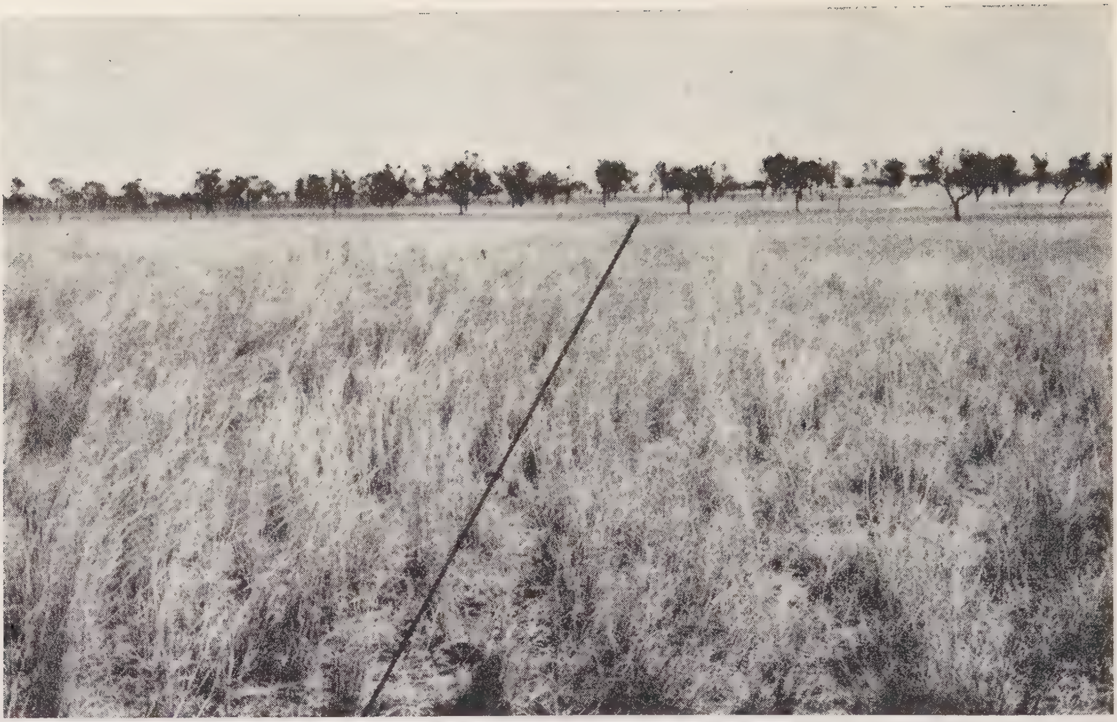


Plate 1

Effect of Cropping on a Native Pasture Dominated by White Spear Grass at Springsure. The area on the left of the black line which was ploughed and planted to grain sorghum 4 years ago, has reverted (after 1 ratoon crop) to a blue grass–dominant pasture.

During the early part of the summer growing season blue grass pastures provide an abundance of highly palatable and nutritious young growth. With the approach of maturity, however, a progressive decline in food value sets in, with the result that during the winter months the pasture has an extremely low feed value.

The early pastoralists found an apparent remedy for this seasonal deterioration in pasture quality. This was to burn strips of grass during the autumn and winter, commencing as soon as possible after the wet season. This practice had the effect of providing a readily-available young green shoot high in protein during the winter months.

From the long-term point of view, however, the method proved harmful. The sheep concentrated on the burnt strips, which altogether comprised a relatively small proportion of the paddock, thus resulting in localised overstocking. This resulted in the gradual disappearance of the better pasture species and their progressive replacement by the unpalatable pest grasses.

As the proportion of these pest grasses increased graziers burnt as early and as frequently as possible firstly in an attempt to prevent the grass from seeding, and secondly because only in the very young stages could any feed at all be got from them. This only aggravated things and they found themselves in a vicious circle.

Seasonal Conditions.—Marked irregularity of the yearly rainfall pattern is a feature of the Queensland climate and this irregularity has an important effect on the composition of the pastures.

White spear grass and Yabila grass are more drought-resistant than blue grass.

On the other hand, a feature of above-average seasons in the Central Highlands is the remarkable capacity of blue grass for re-establishing itself from seed. Thus, the bad management practices mentioned previously as being the main cause of pasture degradation can be aggravated by drought whilst a run of good season can be a tremendous aid towards rehabilitation of the grasslands.

It is on record that the years 1930-40 were bad years in the Central Highlands, and reports from reliable sources indicate that there was a widespread decline in blue grass over this period.

The period 1947-50 saw an improvement in rainfall conditions which after a short break in 1951-52 was followed by three years (1954-56) each of approximately double the annual rainfall. It is common knowledge that the proportion of blue grass in the downs pastures improved considerably during this period.

Below-average rainfall was experienced in the area east of Springsure during the period 1957-59 and this coincided with the increase in white spear and Yabila grass in the Arcturus Downs and Orion Downs areas.

Distribution Pattern

A feature of white spear and Yabila grasses is that they can occur in pure stands or mixtures of varying proportions. It would appear that the distribution of the two species is bound up in some way with types of country. For instance, Yabila grass is commonly found in flats and hollows running back from tea-tree gullies, whilst white spear grass seems to favour the harder country as represented by bloodwood ridges. However, these are apparent exceptions to the general pattern of distribution.

History of Pasture Degradation

Pasture degradation in the Central Highlands first attracted notice in 1915. Since then it became progressively worse, and by 1938 white spear grass was regarded as second only to dingoes as a pest of sheep. The combined effect of dingoes and white spear grass caused many graziers to turn from sheep to cattle during the early 40's. Although by so doing they avoided the problem of grass seed in wool, the problem of low nutritive value of the degraded pastures remained.

Control of White Spear Grass

In 1948 the Queensland British Food Corporation became interested in large-scale farming operations in the Central Highlands, and acquired several large properties for this purpose. Some of these properties were known to have considerable areas more or less heavily infested with white spear and Yabila grasses.

The farming activities of the Queensland British Food Corporation and a few agriculturally-minded graziers demonstrated a practical remedy for white spear grass. It was found that when heavily infested areas were cropped and allowed to revert to natural pasture, the resultant pasture showed a considerable increase in blue grass at the expense of white spear grass. (See Plate 1.)

The good seasons prevailing generally since the commencement of the farming era (particularly during 1954-56) were of material assistance in this widespread improvement of native pastures, through the reduction in white spear grass and the regeneration of the blue grass.

Control of Yabila Grass

Unlike white spear grass, however, Yabila grass does not lend itself to this method of treatment. It is able to re-assert itself in the pasture that develops following cultivation, and other methods of control are necessary for this grass.

Investigations in the Central Highlands during 1959-60 have drawn attention to the remarkable capacity of blue grass seedlings to establish themselves in between the tussocks of Yabila grass. In many instances, however, the young blue grass plants were severely grazed, and even pulled out, by too early grazing, thus slowing down or preventing the rehabilitation of the degraded pastures.

Several instances in which graziers claimed an apparent increase in blue grass over Yabila grass following burning have also been investigated. It was found that, in addition to removing the accumulation of dead growth, the fire reduced the size of the Yabila tussocks considerably, thus providing more room for the young blue grass plants. Here again, however, it was only too obvious that successful blue grass regeneration depended on spelling the pasture after the burn.

Cattle as well as sheep need to be kept off the burnt area. Also, in some cases—mostly in the vicinity of scrubs—marsupials (which appear to have the same selective grazing

Plate 2

Selective Overgrazing by Cattle is Hindering Regeneration of Blue Grass in Pasture Which is Infested with Yabila Grass (large tussocks). Many of the young blue grass plants are being pulled out.

tendency as domestic animals) are important agents in preventing regeneration of blue grass. (See Plate 3.)

The Role of Burning

These grasslands have always been subject to periodic fires from lightning and from hunting activities of the aborigines. Thus, at least some burning may be regarded as a normal feature of the environment under which these pastures have developed.

Fire offers a means of overcoming the selective grazing of stock by reducing all species to a common height (in the same way that a mower is used on smaller areas). If left to grow unchecked the tussocks of Yabila, white spear and even blue grass become very large. These, together with the accumulation of several year's dry stubble, can form an effective barrier to the grazing of stock, and to the establishment of blue grass seedlings. Burning offers a cheap and effective means of overcoming this pasture condition.

Discerning graziers of the "old school" admit that burning should be done immediately after a good fall of rain. Adequate moisture and possibly damp stubble not only minimise the effect of heat on the crown of the plant and the surface of the ground but also assist the early commencement of growth.

Commendable as this rule is, however, it is only part of the correct use of burning as a factor of pasture management.

The growth which grass makes after a burn (or for that matter at the commencement of a new growing season) utilises food reserves stored in the crown and roots from the previous period of growth. These reserves can be replenished only by means of food produced by the leaves as soon as they have completed their growing phase. Grazing of these leaves as soon as they appear results in the eventual death of the plants from starvation. Thus the stocking on this new growth should be regulated to allow the development and maintenance of an adequate amount of leaf area.

Because of the fact that the major part of native grass growth is made during summer, particularly in the period December to March, a pasture burnt in summer would have a much greater prospect of quick recovery than one burnt in winter. The best time of all would be after the first substantial summer storms, but before the commencement of the wet season proper.

Pastures containing a high proportion of blue grass and burnt in early summer require only the bare minimum of spelling provided that they are not subsequently overstocked. Where the proportion of blue grass is low, however, a longer spelling period is required. Given reasonable rainfall conditions, blue grass burnt in December-January and subsequently spelled produces seed in about 8 weeks. Germination of this seed occurs after the first substantial rain. To allow the resultant seedlings to develop to the stage where they can withstand grazing, a spell of three to six months would be desirable.

In order to avoid selective overgrazing of the burnt area, this should comprise either the whole of the paddock or a portion sufficiently large to carry the stock. Where the burn is confined to a portion of the paddock, the remainder (or at least an adequate part of it) should be burnt at the next favourable opportunity to distribute the grazing over the whole of the paddock.

Introduced Pasture Species

Trials with Rhodes, buffel and green panic have been carried out at several sites on the arable lands of the Central Highlands. For ease of establishment and first year carrying capacity they have proved inferior to sudan grass, which in this area also has the advantage of persisting for at least two years. In addition, these grasses

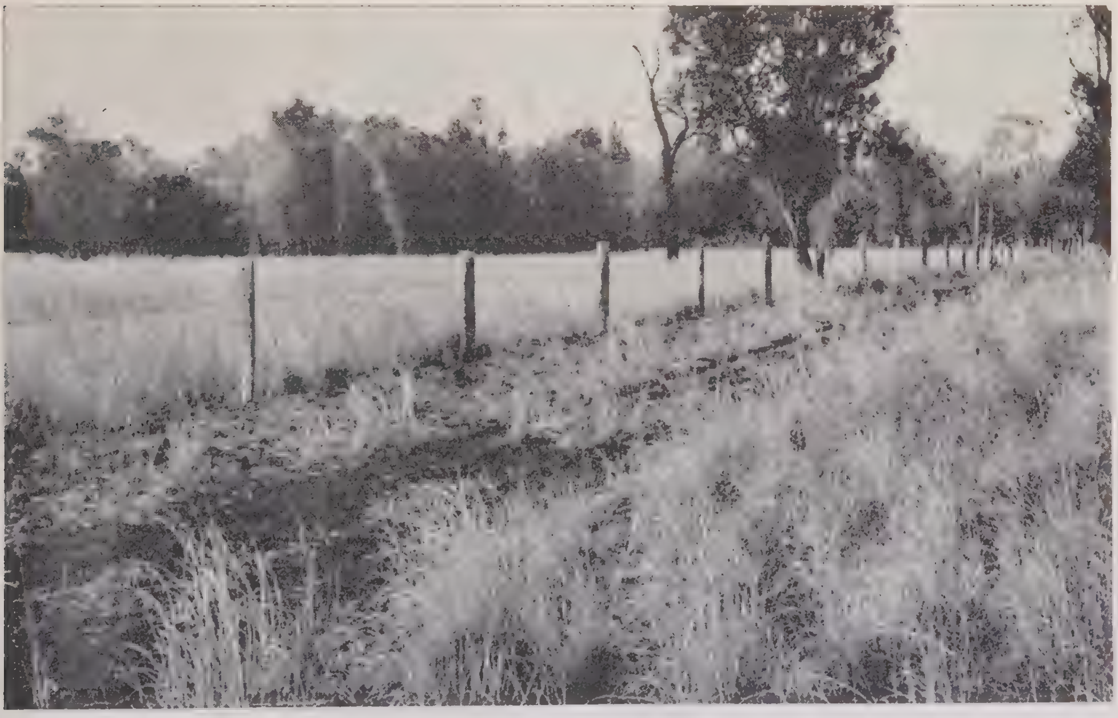


Plate 3

Effect of Protection from Grazing on Blue Grass Regeneration Following a January Burn (Springsure). The area on the right is dominated by Yabila grass (although considerable numbers of blue grass seedlings occur between the tussocks). The rest of the paddock was burnt. Where subsequently protected from grazing (on left of fence) blue grass has become dominant. Where not protected (on right of fence) regeneration of blue grass is being prevented by selective over-grazing (in this case by marsupials).

are unable to match the colonising ability of the native blue grass, and are thus not a satisfactory answer in this area to the white spear and Yabila grass problem.

A Practical Approach

The high cropping potential of the degraded blue grass pastures which have been invaded by white spear grass and/or Yabila grass offers a practical method of improving the pastures and increasing the productivity of the land.

Summer grazing crops such as sudan grass serve the dual purpose of (1) providing alternative high quality grazing during the season when spear grass seed is troublesome and (2) enabling the beneficial burning and spelling of pastures where Yabila grass is prevalent.

These, in combination with winter crops (grown on summer-fallowed land), and home-grown grain used during the dry spring months, will enable stock to be fed adequately on a year-round basis.

A system of shifting cultivation on a propert which aims at embracing eventually the whol of the area infested by white spear grass wi result in increased production and the eventua rehabilitation of the pastures.

Any areas of white spear grass which ar unsuitable for cultivation because of steepnes of slope or shallowness of soil could be treate in the same way as the Yabila grass areas, tha is by judicious burning plus spelling.

The provision of alternative sources of fodde during the winter-spring period means that us of native pastures is mainly confined to th summer. They can thus be stocked accordingl to their summer carrying capacity. This result in a much greater use of the feed produced, an prevents the pasture from getting out of contro half way through the season as is the case whe they are stocked according to winter-sprin capacity.

* * *

A Proud Champion

Top Stud Ram of Malvern Hills, Blackall, and Champion for 1960 at the Blackall Show.

Plate 1: **A Field of Well-Grown Cotton Ready for Picking.**

Cotton Growing In Queensland

By Officers of Agriculture Branch.

The main cotton-growing districts in this State, since the development of the industry from about 1920, have been the Callide and Dawson Valleys of central Queensland. These have been folowed by the central and upper Burnett, with smaller areas sown in the south Burnett, Lockyer, Fassifern and Brisbane Valleys. More recently, however, interest has been shown in cotton growng in north Queensland. This has been paricularly so on the lower Burdekin and in the Mareeba-Dimbulah area where large-scale irrigaion facilities have been provided by the Tinaroo Falls dam.

On recently opened irrigation settlements at Gibbergunyah on the Dawson River near Theodore, and on the Balonne River at St. George, promising crops of cotton have been grown.

On the northern and western Darling Downs there has been some considerable expansion of cotton growing, and several large individual acreages have been planted.

The industry is at present assisted by guaranteed prices, the current guarantee by the Commonwealth Government being an average net price of 14d. a lb. of seed cotton for five years as from January 1, 1959. Cotton production data for Queensland for 1946–47 to 1958–59 are shown in Table 1.

Cotton is a very useful crop for mixed farms and could be included in the farming programme of most dairy farms in central and south-eastern Queensland. It cannot be emphasized too strongly, however, that the area under cotton should be determined by the amount of time available to attend to the crop. If correct land

TABLE 1

COTTON PRODUCTION IN QUEENSLAND 1946–47 TO 1958–59

Year	Area	Production of Seed Cotton	Yield of Seed Cotton per Acre
	Acres	Lb.	Lb.
1946–47	8,975	2,197,709	245
1947–48	6,688	2,069,740	309
1948–49	2,232	736,882	330
1949–50	2,532	1,106,919	437
1950–51	3,594	1,493,595	416
1951–52	5,397	2,156,018	399
1952–53	10,082	5,424,314	538
1953–54	8,012	3,687,865	460
1954–55	15,269	5,651,270	370
1955–56	9,717	3,929,523	405
1956–57	8,726	3,413,597	391
1957–58	9,550	4,011,166	420
1958–59	17,196	9,469,698	551

(Figures supplied by the Cotton Marketing Board)

preparation is carried out and good cultural practices followed, the risk of crop failures will be reduced and the average yield per acre over a series of seasons raised. There will be an accompanying reduction in the cost of production as compared with crops which do not receive such attention. Where the right combination of variety, soil, cultural methods and climatic conditions exist, good yields can be obtained. Over a series of years, the average yield of rain-grown cotton obtained by growers using sound cultural methods is about 700 lb. to the acre. In favourable seasons, yields of 1,200 to 1,500 and occasionally 2,000 lb. of seed cotton to the acre may be obtained. Under irrigation, regular yields in the vicinity of 1,500 lb. have been achieved over areas of 100 acres or more.

Efficient production means a steady output and a greater degree of stability in the industry. This is most important, for a wide fluctuation in the total yield from season to season increases the difficulties of financing, ginning and marketing the crop.

Climatic Requirements

Cotton is a summer-growing crop which has been planted at some time or other in most farming districts in Queensland, and it is known that good results can be achieved in them if the crop receives the correct cultural treatment.

It can be grown as an annual and as a ratoon crop, but experience has shown that ratoon crops have rarely given satisfactory results. Insect control, plant structure and growth behaviour i
such crops are usually unsatisfactory and th
practice of ratooning is not recommended
although in some instances good ratoon yield
have been obtained.

In areas where frosts occur, and these includ
most cotton-growing districts, the time of plantin
is important. Late frosts in spring slow dow
germination and seedling growth while earl
frosts may affect the crop before all bolls hav
matured. Usually, a frost-free period of at leas
five months is considered necessary. However
a longer period is desirable as the soil takes som
time to warm up after the last frosts. In th
United States of America a soil temperature o
60 to 65 deg. F. at a depth of 6 in. over a fou
or five day period is considered necessary befor
it is safe to plant.

Growing cotton under rainfall conditions i
areas with less than a 25 in. average annual rainfall cannot be expected to result in regular payable yields. An expectation of at least 15 in
during the growing period of the crop in south
and central Queensland, that is, normally from
October to March inclusive, is regarded as
reasonably safe figure.

In the northern sections of the Stat
particularly on the coast, the heavy rains usuall
experienced during January to March may b
detrimental to cotton planted in early summe
This is because excessive vegetative growth of th
cotton plant and difficulty in controlling weeds ar
encountered. However, autumn plantings ar
practicable in these areas as temperatures ar
mild and adequate for the development of th
crop during winter.

Good cultural methods can do much to offse
the somewhat erratic rainfall of the agricultura
areas of Queensland. Early ploughing and fallowing of the land intended for the cotton cro
makes possible full absorption by the soil of th
late autumn, winter and spring rains. The goo
subsoil moisture reserves so obtained are the bes
insurance against periods of dry weather and ar
a major factor in producing payable cotton crops

Cotton is a drought-resistant plant in that i
rarely dies in a long period of adverse conditions
However, the plant must not only stay alive bu
must produce and hold a crop of squares, flower
and bolls. This crop may be shed readily by th

plant if stress conditions occur, ability to withstand them being dependent on the amount of moisture available. At these times land which was ploughed early to trap winter and spring rains may hold sufficient soil moisture reserves to enable the plant to overcome critical dry periods.

Soil Requirements

Provided the climatic environment is suitable, cotton will grow on most soils, but some soils are safer than others and can be expected to provide better and more consistent yields.

For rain-grown cotton, clay loams overlying clay subsoils at depths of 12 to 36 in. are the most reliable. There are many thousands of acres of this type of country in Queensland. It comprises much of the flats and lower slopes of the eucalypt forest country. Original timbers on these flats and slopes were box and both broad and narrow leaved ironbark.

Much of the brigalow scrub country is suitable, particularly where associated with belah. The heavy, dark-grey or black soils of the open plain country are also suitable although more difficult to manage. All these soils have in common the ability to retain moisture.

If early ploughing facilitates the penetration of winter and spring rains, these soils will build up a supply of subsoil moisture available to the plants in dry times.

Some of the very heavy brigalow soils, however, are badly drained and accordingly are not suitable for cotton. These heavy, unsuitable soils are usually recognised readily by a growth of whipstick brigalow or by the formation of melon holes or gilgais.

There are other soil types which can produce good yields of cotton but which are more subject to fluctuations caused by weather changes. The fertile clay loams and loams of the alluvial soils which originally grew gum or a mixture of ironbark, box, bloodwood and Moreton Bay ash are in this group. They are capable of producing good yields under favourable seasonal conditions, particularly if rotation is practised.

Probably the least suitable soils are the deep red loams of the softwood scrubs. Crops on these soils tend to make excessive vegetative growth under good rainfall conditions and suffer severely if dry conditions develop.

The deep sandy soils adjacent to streams, because of their inability to retain moisture, are also unreliable cotton soils.

Following severe losses of crop on these two soil types during dry periods, the plants frequently make excessive vegetative growth when rain does fall and generally only small yields are harvested. Under irrigation conditions, however, soil moisture can be controlled, and these sandy soils are then capable of producing good yields.

On the Burdekin, good cotton crops can be produced on the light, well-drained sandy loams of the delta. These, possessing as they do, a permeable subsoil, are more easily handled during the January to March period than the clay loams with a clay subsoil, which are much favoured elsewhere. Unfortunately, the wet season rains frequently result in plantings being late in these clay loams, because of the delay in land preparation. On the other hand, there is generally ample opportunity for establishing and cultivating early plantings on the sandy loams.

Crop Rotations

Experience on all soil types under rain-grown conditions has shown that cotton yields well for two or three seasons following pasture, but that continuous cropping will then result in declining yields. There are two main reasons for this.

The first is that the physical condition of the soil after being spelled to grass is much improved, which means that there will be better penetration of rains and retention of soil moisture. This largely rectifies the deterioration caused by several years' continuous row cropping under which the soil structure is broken down and the soil tends to pack, with the surface becoming almost impervious to water penetration.

The second reason for the decline in yields is that the chemical balance of plant foods is upset by continuous cropping.

The crops for inclusion in a rotation with cotton will, to some extent, differ with the district and the type of farming. In general, however, climatic conditions are similar in those areas where most of the State's cotton is grown, and the difference in the crops selected may not be great.

Crops commonly included in a rotation with cotton are wheat and oats for grain or grazing as autumn and winter sowings, and maize, sorghum, Sudan grass, millets and pumpkins for summer plantings.

Leguminous crops such as lucerne, cowpeas, velvet beans and field peas should be included in the rotation but not immediately before the cotton crop where it is produced under rain-grown conditions.

A period of pasture should be included.

In dairying districts the improved grazing from pastures sown in rotation with cotton crops has resulted in higher returns from the herd. Even if the pasture is not utilized by the grower for grazing, for instance on farms where no livestock are carried, the seed or agistment may well provide a source of income. On the Burdekin, good cotton crops have been produced, with the aid of supplementary irrigation, on well-drained sandy loam delta soils in rotation with sugar-cane.

Equipment

Where the planting of areas up to about 10 acres is contemplated, the machinery usually available on most mixed farms may be used or adapted for the cotton crop. If they are not already available on the farm, however, the cost of purchasing split-wheel planters and high clearance cultivators is probably not justified for such small acreages. But for the planting of large areas, adequate equipment suited to the cotton crop's requirements should be obtained.

The first requirement is a split-wheel planter either two or four row depending on the are to be planted. The principle of the split-whee is that it firms the soil on either side of th drill and leaves it loose immediately above th seed.

This is important with cotton because th germinating seedling is tender and unable t force its way through a hard-packed surface crust. Compaction of the soil on either side of the drill brings the seed into closer contac with damp soil particles and also reduces loss of moisture by closing small cracks and pockets

In some areas, combines are used for planting by blocking off some of the runs and sowing in rows 42 in. apart. On the whole, stand obtained by this means are not good, because the seed does not run freely and unless the soil is in first class condition the seedbed i left too open. Soils which do not pack har on top can, of course, be rolled after planting but such a practice is risky on heavy soils.

Similar unsatisfactory results follow planting with high-wheel maize planters unless soil texture and moisture leave little to be desired.

The cost of split-wheel planters may be deterrent to their purchase in a number of case but is justified by the improved stands obtained Four row machines are available for large areas

Early cultivation of the seedlings is essential consequently the implement used must be capabl of accurate handling. It is an advantage t

Plate 2

Grassed Open Forest nea Biloela, with Ironbark Tree in Foreground.

run the tines as close as possible to the small plants without injuring them. Mid-mounted equipment is very suitable for this purpose, because the operator can observe the clearance between the tines and the plants. This enables him to make a close setting of the tines and thus obtain a satisfactory degree of weed control. Guards should be fitted to the inside tines to prevent loose soil burying the small seedlings.

Cultivation should be carried out as long as it can be done without damage to the plants and for this purpose a high-clearance tractor is essential wherever reasonably large areas of cotton are being grown. Tractor horse-power requirements vary with the area to be planted, but it is usually better to have more power than not enough. Multiple row planters and cultivators requiring considerable horse-power are essential to cover large areas quickly.

For the destruction of plant stalks, a sturdy rotary slasher is very effective, allowing complete covering of the plant material when the land is disced or ploughed.

Thinning by cross cultivation is cheaper than hand labour which is expensive and often difficult to obtain. A tined implement is preferred for this purpose, with small duck feet that are more effective than the points of spike tooth or drag harrows. By adjusting clearances between tines, allowance can be made for heavy or light stands.

Preparation of Seedbed

In seasons of good winter and spring rainfall, successful results may be obtained with indifferent methods, but over a series of years it undoubtedly pays to prepare the seedbed so as to store up the maximum possible amount of subsoil moisture. In seedbed preparation an early clean-up and ploughing are necessary, while consideration must be given to the depth and number of ploughings. Seedbeds are prepared at a different time of the year in northern coastal areas.

Early Clean-up and Ploughing.—Early ploughing for seedbed preparation, preferably during the late summer, traps the later portion of the monsoonal rains and is particularly valuable on old cultivations. Failing this, ploughing should be carried out before the June rains, or soon after, and before the moisture in the surface soil is lost.

Although the benefits to be obtained from early ploughing on old cultivations have been clearly shown, the yield differences have not been so clear-cut with new country or in the first few seasons following Rhodes grass. Even with these newer cultivations, however, it is desirable to prepare land early.

Ploughing for cotton should not be delayed until July or August, when the surface soil is often dry and hard. Good ploughing is impossible under these conditions, and in addition the subsoil may be dry to at least 2 ft. if it has been cropped previously.

It has been shown that a gain of soil moisture equivalent to at least 1 in. of rain is obtained in the upper 18 in. of soil by ploughing ahead of the June rains. Ploughing before June can seldom be done following cotton, however, and this fact lends further support to the desirability of growing cotton in rotation, particularly with crops which can be harvested in time to allow early ploughing.

General experience with ploughings made before June indicates that it is inadvisable to firm the ploughed soil into a compact seedbed until after the winter rains, especially if the soil is of a clay type. The winter rains frequently pack a firm seedbed of clay soil so hard as to necessitate cross-ploughing. However, if the ploughing done before June has been left in the rough state, the winter rains penetrate well into the subsoil and yet leave the ploughed soil in a suitable condition for the preparation in August of a satisfactory seedbed with one or two workings with the spike-tooth harrow. Occasionally on the heavier soils it will be necessary to substitute one disc harrowing and then fine the surface with a spike-tooth harrow.

If a field cannot be ploughed until after the winter rains, it is desirable to prepare the seedbed as soon as possible after the ploughing to reduce loss of moisture and also to obtain a suitable tilth in which to plant the seed. It is particularly advisable to disc or work the day's ploughing with a spike-tooth harrow right after the ploughing if the soil is moist and of a clay type containing little organic matter. A delay in carrying out these operations may result in the ploughed soil drying in a very hard, cloddy condition that will require extra working. This working might involve rolling with a cultipacker, disc-harrowing and then cross-disc harrowing, with a final spike-tooth harrowing, before even a reasonably satisfactory seedbed can be prepared.

Where cotton is to follow cotton, the rotary slasher mentioned earlier is the best implement for handling the standing stalks. However, where they are not too tall or bulky, disc cultivators can do a reasonable job of levelling and chopping up the plants. The aim is to reduce the plant residues sufficiently to allow complete incorporation in the soil by the following ploughing. The smaller the portions the easier it is to plough them under to rot in the soil. If large pieces of residue remain undecayed they can interfere with the planting and cultivation of the following crop. Flail type forage harvesters have also been used with good results for dealing with the standing stalks and other crop residues.

Depth and Number of Ploughings.—The depth and number of ploughings required vary with the soil type and climatic conditions. With the exception of the breaking-up of new cultivations, one ploughing from 5 to 6 in. seems to be suitable in most districts. Some of the heavier clay or clay loam soils tend to set very hard if much winter rainfall is experienced. On these, cross-ploughing early in the spring may be advisable to loosen up and warm the seedbed if excessive winter rains have fallen after the first ploughing.

Late cross-ploughing, however, should not be practised if it can be avoided, because soil moisture is lost, and the dry surface soil turned under by the ploughing may react against seedling growth during dry spells. Growers are also reminded that some loss of stand may be caused if they adopt the deep ploughing and cross-ploughing methods used in preparing seedbeds for potatoes, sugar-cane and some other crops. One ploughing of 5 to 6 in. has become more general for cotton, thus minimising the loss of subsoil moisture.

As with other row-cultivated summer crops, every care should be taken in preparing and cultivating land to ensure that losses of soil from erosion are kept to a minimum.

Seedbed Preparation in Northern Coastal Areas.—The discussion of seedbed preparation has been confined so far to areas south of Mackay. From there northwards, however, climatic and other conditions on the coast necessitate seedbed preparation being undertaken at quite a different season of the year.

In order to improve the chances of earl planting in northern coastal areas, seedbe preparation should be commenced before th onset of the wet season rains. If the preliminar ploughing operations have been completed, onl light cultivations, such as discing and harrowing will be required to bring the soil into good tilt should a break in the weather present an oppor tunity for planting. It is considered undesirable however, to work the land into a fine tilth befor the rainy season, for heavy rains will then pac the soil and possibly cause erosion.

The number of ploughings required is depen dent on the condition of the soil, but usuall two are sufficient. The land should be turne over during the early summer, when storm rain frequently provide the opportunity to work soi that has been in a very hard dry condition. Th second ploughing should usually be complete before the end of December, but in dry year it might be advisable to delay the operation unti the first break in the weather after the commence ment of the rainy season.

Experiments to test the value of differen fertilizers have been carried out in the mai cotton-growing districts on various soils wher cotton has not grown satisfactorily.

Increases up to 100 lb. of seed cotton to th acre have been obtained in some seasons by th addition of nitrate of soda as a top-dressing o very poor soils and on hard, tight-textured blac clays of the open plains type. On some o the older cultivated scrub soils in which th potash content is low, increases up to 80 lb of seed cotton per acre have been obtained b applying 1 cwt. sulphate of potash per acre These gains cannot be considered satisfactory o an economic basis.

While this has been the experience with rain-grown crops, recent trials with irrigated cotto indicate that economic increases in yield may be obtained with nitrogenous fertilizers using u to 4 cwt. of sulphate of ammonia to the acr applied in two dressings. The first dressing o 2 cwt. was applied at the commencement o flowering.

Where soils are known to be somewhat low in their phosphoric acid content, it may be advisable for cotton growers on such soils to test the value of 2 cwt. superphosphate to the acre, applied before planting. This may be placed in the bottom of furrows 4 in. deep, after which the furrow is covered over and the seed planted along the centre.

Varieties

Of the varieties sown at the time of writing, Miller, New Mexico Acala and Empire are the most widely grown. In addition to these three main varieties, Triumph and Rowden are also grown to some extent.

Miller.—Of the main varieties, Miller occupies by far the largest acreage and over a wide range of soils can be considered the most reliable cotton for central and southern Queensland. It does well either as a rain-grown or irrigated crop and is easy to pick both by hand and mechanically. The plant produces lint of medium staple and good quality of a type suitable for Australian spinners' requirements. Several strains of this variety have been developed and, of these, Miller 43.9.0 is the most popular.

New Mexico Acala.—New Mexico Acala is another big boll, medium-stapled cotton which is somewhat faster in maturing than Miller. It produces a good quality lint of a very uniform character. This variety does not appear to possess the drought-resistance of Miller but it does well under irrigation. On fertile soils with ample moisture it tends to make rank growth and under these conditions is not suitable for mechanical picking.

Empire.—One of the more recent introductions from the United States is Empire, which differs in lint qualities from the other big boll types, such as Miller and New Mexico Acala, in that it produces a much finer, longer lint. It forms a medium-sized, compact bush, possesses the advantage of quick maturity and develops a large proportion of its yield for the first pick. This variety, because of its long fine lint, presents difficulties in the removal of trash in the lint cleaning processes. This difficulty will probably be overcome to a large extent when the new ginning and cleaning equipment ordered by the Cotton Marketing Board is installed in the ginneries. Until this eventuates, hand picking of Empire cotton is recommended. If this variety is planted under rain-grown conditions, poor moisture retaining soils such as deep sandy loams should be avoided.

Triumph.—Triumph is a quick-maturing, high-yielding, medium-stapled variety, producing smaller bolls than Miller and New Mexico Acala. It is particularly suitable for the more fertile alluvial soils, and is also the most suitable variety for softwood scrub soils although these soils are not recommended for cotton growing as a rule. Because of its ability to set a crop quickly Triumph is able to recover from a setback and form a crop where other varieties fail. It is regarded as a suitable variety for northern coastal cotton growing areas, including the Burdekin, where so far it has given results superior to those obtained from the Miller variety.

Rowden.—The other lesser grown variety, Rowden, which is similar in many respects to Miller, tends to make excessive vegetative growth on fertile soils.

Other Varieties.—A number of other varieties, while producing high yields of good quality cotton on fertile soils under supplementary irrigation, are not suitable for rain-grown conditions. These include Delta and Pinelands, and several strains of Acala and Stoneville. Another six varieties are under test in various districts and a number of these are showing promise.

Choice of Variety

In choosing a cotton variety, the following points should be considered:

A. *Temperature.*—Quick-maturing varieties are preferable in colder districts such as the eastern Darling Downs where growing seasons are shorter than elsewhere in the cotton-growing country.

B. *Rainfall.*—A comparatively drought-resistant variety such as Miller may produce a good yield on marginal rainfall areas on which New Mexico Acala or Empire might fail.

C. *Soils.*—Crops on fertile alluvials may be rank in growth if a variety such as Rowden is chosen, whereas Empire or Triumph would do quite well on them.

D. *Method of picking.*—A long-staple variety such as Empire could produce a higher yield than Miller but give a lower return financially if the lint has to be downgraded because of excessive trash when machine picked.

Pure Seed Supplies

The responsibility for developing supplies of seed of suitable varieties of cotton for the different districts of the State is vested in the

Department of Agriculture and Stock through legislation, passed with the approval of the representatives of the growers.

The aim of the Department has been to organise the districts on the basis of one-variety communities. This is being attempted in all cotton-growing countries, for it has been demonstrated that it is not only advantageous in maintaining the purity of a variety, but also in developing sound cultural practices and in marketing the crop.

Plate 3

Four-Row Split-Wheel Planter.

Nowadays the demand is for cottons ranging from $\frac{7}{8}$ to $1\frac{1}{8}$ in. and the Queensland industry is devoted entirely to growing varieties which produce this staple length of cotton. Varieties of this class show a marked preference for definite soil types and climatic conditions.

Unfortunately, any variety of cotton will deteriorate rather rapidly unless the purity of the type is maintained by carefully conducted breeding operations. It is necessary, therefore, to operate a system of seed replacement in every variety grown, whereby, in each season, pure stocks can be made available for distribution. The system which has been developed in Queensland aims at sending to the oil mill each season all seed that is in more than the fourth year of multiplication after being released for general distribution. By this method it is hoped to maintain a high standard of quality in each variety.

Planting the Crop

When planting the crop, consideration has to be given to the time, method and depth of planting, to the spacing and length of the rows and to the rate of planting.

Time of Planting.—Planting should be carried out as soon as conditions in the spring are favourable for obtaining and maintaining a good strike. On old cultivations of fertile alluvial loams and clay loams, and on the average of the scrub soils, the best results over a series of seasons have been obtained from plantings made during late September and the first half of October in the central district, and during the latter half of October in the south-eastern districts. On old cultivations on the heavier clay loam soils, plantings up to mid-November can be made with good prospects of obtaining profitable yields, but this should be considered the latest possible planting date on the Darling Downs. Plantings can be made later on new cultivations on all soil types even as late as early December in districts south of Mackay, except on the Darling Downs.

No advantage appears to be obtained by planting in August or early in September, even if moisture conditions are favourable. The low soil temperatures then prevailing retard germination and during the following few weeks rains may chill the young seedlings so much that usually early October plantings catch up with them, and often give a much better stand. In some seasons a very heavy loss of terminals occurs in early September plantings through insect attacks, while later plantings suffer much less damage.

Plantings in northern coastal areas, as indicated earlier, are usually made after the wet season in March and April.

Method of Planting.—Several methods of planting cotton seed are used in this State, all of which are satisfactory when favourable conditions exist. In most districts the best result will be obtained by waiting until a good planting rain occurs, harrowing to make a loose mulch, and then planting with a split-wheel type of planter equipped with disc openers (Plate 3). The harrowing not only warms the soil and thus hastens germination, but also checks an early growth of grass and weed seedlings. This latter point is important because it assists materially in reducing the cost of cultivation. The harrowing before planting is particularly necessary when cotton follows Rhodes grass, for if it is not done, the grass seedlings germinate with the cotton and hand-chipping is soon required.

Growers planting large acreages of cotton are faced with the problem of getting their crops sown so that they will obtain the fullest benefit from the spring rains. As these seldom occur in more than 2-in. storms, and are often lighter, it is frequently impossible to get the intended acreage planted on the one storm unless considerable equipment is available.

Some growers therefore plant all their acreage in the dry soil prior to the spring rains. Others plant half in the dry and half following the first good rains, while others plant as much as the soil moisture will allow following the first rain, and then wait for further rains to complete their plantings. The last mentioned system is preferable in some respects, for it distributes subsequent operations over a longer period and spreads the labour demand more evenly. The spring rainfall is most uncertain, however, and it is advisable to take full advantage of the rains when they come. The system of planting a portion of the acreage in the dry and the rest after good rains therefore has much to commend it.

The proportions decided on depend to a large extent on the equipment available. Usually sufficient rain falls to allow planting for at least three days under satisfactory soil moisture conditions for seed germination. By planting in the dry soil all but the acreage that can be handled in three days, it is possible to obtain a satisfactory strike over a large acreage from the one rain. The dry planting should be harrowed as quickly as possible after the rain in order to eliminate weed and grass seedling growth. Cotton seed will germinate quickly in late October and in November. Hence any delay in harrowing at this time may result in the destruction of some of the cotton seedlings when the operation is actually undertaken.

Dry planting is attended with certain risks for, in some seasons, much loss of seed is experienced through the spring showers being just heavy enough to germinate the seed, and, should there be no following storms to establish the seedlings, the stand is lost. Again, in wet springs, severe crusting of heavy soils occurs, and in dry-planted areas, even if harrowing is done, the strike may be poor or even a complete failure. The problem is a difficult one, and the general district experience for each soil type must be taken into account by the grower before deciding just what to do.

Some growers of small acreages who have maize planters which are unsuitable for planting cotton seed that has not been delinted, have adopted the practice of opening shallow furrows, sowing the seed by hand, and then covering it by using either a harrow or scuffler. This planting system unfortunately results in loss of soil moisture and undoes some of the benefit obtained from early preparation of the seedbed.

As an alternative it is suggested that delinted seed be used, and that, where an ordinary one- or two-row maize planter is available, the plates be modified to make them suitable for planting cotton seed. This can be done by enlarging the holes in the six-holed plates and adjusting the gears to allow the proper seeding rate.

Depth of Planting.—The correct depth of planting under most conditions varies between 1½ and 2 in., depending on the conditions of the seedbed, the amount of moisture in the surface soil, and the method of planting. The main objective is to get a good stand as quickly as possible.

This requires planting the seeds just deeply enough to have sufficient moisture to germinate them, but without the soil drying out before the young roots penetrate into the moist subsoil. For most soils under average conditions, a depth of about 2 in. in moist, firm soil will allow a good germination. This is especially true if a split-wheel type of planter is used.

Where the seed is covered by scrapers, or by scufflers if planted in shallow furrows, 2½ in. will probably be a better planting depth. The soil is not compacted under these conditions and there is a danger of moisture being lost before germination occurs, particularly if drying winds are experienced.

If plantings are made at a depth greater than 2½ in. there is always a danger of the seed rotting in a cold, wet spring. In a dry spring, while germinations may be obtained, the seedlings are frequently so long in coming through the surface that they are thin and spindly and of a pale, yellowish colour rather than the usual healthy green. Such weakened seedlings are susceptible to attack by disease if wet weather is experienced subsequently, and may wither if hot, dry winds prevail for any length of time. Growers should therefore take care not to plant too deeply.

Row Spacing and Planting Rates.—A spacing of 3 ft. 6 in. between the rows has become the standard during the last few years, this spacing being suitable for machine harvesting. The retention of the older 4 ft. 6 in. spacing would result in the left hand wheel of the mechanical picker running down the unpicked row of plants and causing serious damage. Most tractors and implements can be set to operate at the standard spacing.

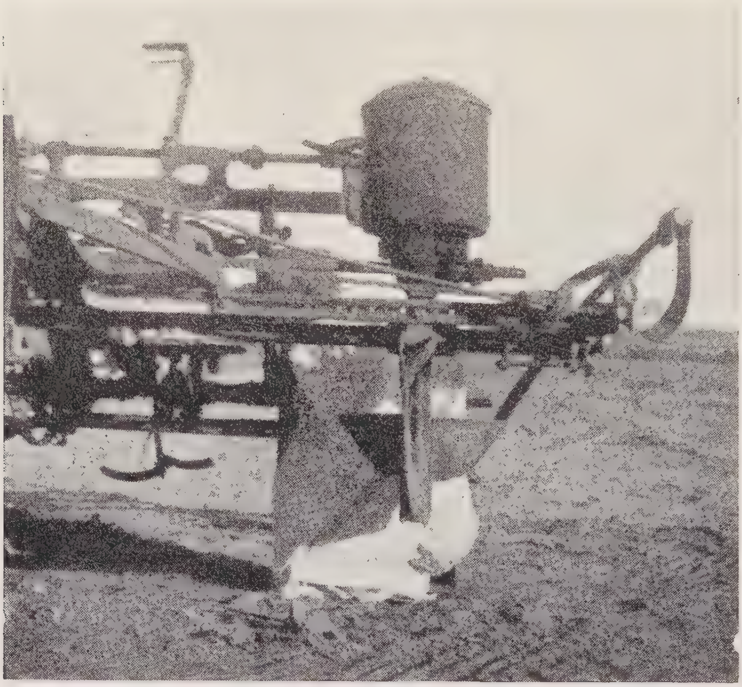


Plate 4

Attachment of "Moisture-Seeking" Equipment to a Cotton Planter. Two plates or wings are attached to a planting boot about 2 in. above its base. These wings remove the dry surface soil from the line of the planting row, and enable the seed to be planted at the correct depth below the base of the furrow thus made.

Plant spacing in the rows is not so standardised as spacing between the rows. The cotton plan adjusts itself to different distances within reaso but gaps of several feet in the rows mean loss of production because the plants cannot make up for such wide spacing. The first essential is to achieve a uniform stand of plants and therefore planting rates should not be kept below the level necessary to achieve this objective.

The cotton seedling is fragile and before it emerges from the ground and for a few days following emergence it may have to survive many hazards. Hence it is considered that, under good conditions, 60 per cent. of the seed planted may develop into healthy seedlings, this percentage thus requiring 15 lb. of average size seed to be sown to the acre to produce a stand of three plants for every foot of row.

On heavy clay soils it may be necessary to plant as much as 20 lb. to the acre to achieve this density of plant population.

Under ideal conditions, with supplementary irrigation, a regular stand of three plants to the foot may be adequately maintained and accordingly may not require thinning. On the other and, however, under rain-grown conditions lose spacing such as this can result in the plants uffering from moisture shortage in dry periods r on sandy soils, and thinning may accordingly e necessary.

However, another factor has to be considered the crop is to be mechanically picked. Close pacing forces the plants to set the lowest bolls igher up on the plant, which is an advantage such picking as it ensures that the bottom olls are not missed by the picker.

A compromise must therefore be made and or hand-picking the plants may be from 9 to 2 in. apart in the rows whereas for mechanical icking they may be as close as 6 in. These ecommendations may require some modification suit various soil types and it is a good plan or the grower to compare several spacings in rder to ascertain the best distances for his own onditions.

The use of delinted seed is recommended for ll plantings except in dry soil, because not only there a more even distribution of the seed in ne row, but in addition germination is more apid.

It is not recommended that delinted seed be own in dry plantings, for, owing to its ability to bsorb moisture better than the seed that is not elinted, light showers will start its germination. sufficient rain to complete the strike does not ll the seed will rot, whereas seed that is not elinted may be unaffected.

Length of Rows.—Experiments have failed to emonstrate that there is any advantage to be ained by planting in any particular direction ther than that dictated by the topography of ne paddock. It is important, however, that the ows be as long as is reasonably practicable. his is desirable to reduce loss of time in turng the cultivator at the end of the rows, and lso for the operation of any mechanical picker sed. The mechanical picker, owing to its size and difficult manipulation requires long rows to maintain efficiency of picking. On slopes where efficient soil conservation methods have been introduced it is necessary to plant the rows on the contour to reduce the loss of soil to a minimum.

Sowing in Northern Coastal Areas.—The planting depth, as already emphasised, is particularly important and largely determines the success or failure of the strike. Accordingly it is generally recommended that the seed be sown in moist soil at a depth of 1½ to 2 in. Land preparation in northern coastal areas (such as the Burdekin) after the cessation of the summer rains, however, dries out the surface soil, and unless the moisture is replenished by rain or irrigation, difficulty will be experienced in obtaining a satisfactory strike. Insufficient moisture in the surface soil has been responsible for strike failures on the lower Burdekin in past years. At the commencement of planting it is therefore advisable to uncover a few seeds to ensure that they are being placed at the required depth.

It is also suggested that if the surface soil is dry while good moisture exists below the 2 in. level, moisture-seeking equipment be attached to the planter or tractor for the purpose of removing the dry surface soil from the line of the row. This, in effect, means that the seed is planted at the usual depth of 1½ to 2 in. in moist soil under the base of a shallow furrow, thus obviating the necessity of applying a pre-planting irrigation.

The planters in common use can be equipped quite easily with plates or wings bolted or riveted to the planting boot for the purpose of pushing the dry soil surface aside (Plate 4). If the bases of the plates are placed 1½ to 2 in. above the bottom of the boot the correct cover will be obtained irrespective of the depth at which the planter is set. In an emergency, furrowing equipment of a type that will provide small shallow furrows may be attached to the tractor directly in front of the planter wheels.

[TO BE CONTINUED]

pasture and crop

Tropical Maize Rust.—A severe type of rust attacked maize crops on the Atherton Tableland last year, and has appeared again this season. It is a new disease which has been identified as tropical maize rust, and is much more serious than the rust which has been present in Queensland maize crops for many years.

Rust spores are carried long distances on the prevailing winds, and in recent years tropical rust has spread from Africa round the Indian Ocean to South East Asia and now to Australia. The disease is favoured by prolonged warm, moist weather and can be expected to cause losses in susceptible varieties during wet seasons, particularly in the northern districts.

The only practical approach to diseases of this kind is the production of resistant varieties. Maize crops on the Atherton Tableland are being watched closely for evidence of resistance in the common varieties and hybrids. Resistant material is also being obtained from Africa by plant breeders at Gatton College for use in the hybrid maize breeding programme.

—*B. L. OXENHAM, Senior Pathologist.*

Air Conditioning.—Before the pilot and the astronaut are exposed to the hazards of air or outer space, it is only reasonable that they should undergo controlled tests, to determine their suitability and their chances of survival.

Our crop plants too must face severe hazards —extremes of heat and cold, rain, drought and driving winds. When breeding a new variety, the plant breeder must consider these hazards. Unfortunately, as long as he must depend entirely on the weather to provide his test conditions, he may have to wait several years before they turn up. Years of delay and wasted effort.

However, it's now possible to provide te conditions at will. Environmental chambers, ai conditioned and light-controlled are commo overseas. Their value is now recognized in th country too, and similar facilities are bein developed.

—*H. M. GROSZMANN,*
Senior Plant Breeder.

Trace Elements.—The chemical elemen nitrogen, phosphorus and potassium are require by plants in relatively large amounts, wi calcium and magnesium needed to a lesser exten No less important are the trace elements, s named because, although they are essential fo plant growth, they must be present in only sma or "trace" amounts.

Most people have heard of the experience the south-east corner of South Australia where was found that application of the trace elemen copper and zinc, in addition to normal fertilize raised the productivity of that area.

The main trace elements concerned in pla growth are molybdenum, boron, iron, manganes copper, zinc and sulphur. Deficiencies in thes elements are frequently indicated by the abnorma shape or colouring of the leaves. If you suspe a trace element deficiency, contact your loc Adviser in Agriculture.

When applying trace elements to a soil, it mu be stressed that it is very easy to convert deficiency into a toxicity, and the heavy han should be avoided.

—*B. J. CRACK, Soil Technologist.*

Agricultural Chemicals.—All agricultur chemicals sold in Queensland are registered wit the Standards Branch of the Department Agriculture. Before registration the preparatio re carefully checked and they will perform the inctions claimed on their labels. However, egistration should not be considered as depart-iental recommendation. The Department will ive you advice on any pest or disease control roblem you submit.

We are going through a period in which many ew agricultural chemicals are available. Before ou try something new, give the matter careful onsideration. If the chemical you are using at resent is satisfactory in all respects, why hange? Look for some outstanding advantage the new material and find out if it has been ell tried. A non-poisonous preparation is safe use, safe for children, stock and for the onsumer of your produce.

—*N. D. IRWIN, Registration Officer.*

Marketing Cotton.—The procedure for arketing Queensland's cotton crop is somewhat nique among our primary products. The knitng and weaving portion of the crop, that is the igher grades, is virtually assured of disposal to ustralian cotton spinners at import parity prices. pinners are permitted to import the balance of ieir raw cotton requirements duty free *provided* iey undertake to purchase this portion of the ueensland crop.

However, this assured market does not apply the lower grades, the disposal of which is urely dependent on the requirements of cordage nd bedding manufacturers.

Besides a virtually guaranteed market for a rge portion of their crop, Queensland cotton rowers also have the advantage of a guaranteed rice. If realisations from the sale of the crop ll short of the guaranteed average price over ie whole crop, the deficiency is made good by ie Commonwealth Government.

—*K. CHESTER, Marketing Officer.*

Give Lucerne a Chance.—Farmers who egularly rely on lucerne to pull them through dry spell need no reminding that planting skill reatly influences the success of their stand.

It is only commonsense to give the crop every hance. And to get a sturdy, vigorous stand, a ew planting points must be observed:

Your first care will be to select the right variety, and here you can't do better than Hunter River Broadleaf. Experience has shown that this is the best commercial variety in Queensland. The seed should be of good quality and have a high germination. Before planting, it should be inoculated with a strain of nitrogen-fixing bacteria. The Department supplies inoculum free of charge; all you have to do is to write for it, giving the name of the crop and the quantity of seed you'll be planting.

Lucerne seed must be planted in well-prepared land. The final seedbed should be of fine, compact tilth, and shallow. The recommended planting time is now.

The most satisfactory method of planting lucerne is through a seed drill, using a lucerne box if you have one. If you have to sow through a standard combine, a sawdust filler will be needed to get a suitable planting rate.

With a combine, the planting rate is 10 lb. of seed to the acre. If broadcasting by machine, the sowing rate is about 11 lb., but if broadcasting by hand you may have to use up to 14 lb. an acre to avoid a patchy strike. In districts with an annual rainfall below 25 in., row plantings using as little as 1 lb. of seed to the acre have been successful for grazing stands.

Whatever planting method is employed, shallow planting ½ in. to 1 in. deep is the rule. On self-mulching soils, deeper planting about 1½ in. to 2 in. is suggested.

Remember to use a "mother" crop of oats or wheat, sown at 15 to 20 lb. an acre, no more. The mother crop will help to keep down annual weeds and to protect the young lucerne from heavy frosts. But handle the mother crop to suit the lucerne, not the reverse.

—*V. J. WAGNER, Chief Agronomist.*

Buffel Seed Harvester.—The only catch in growing your own buffel grass seed is the difficulty in harvesting it. But now, mainly through the efforts of farmers and graziers themselves, this difficulty has been largely overcome.

Laborious and slow hand plucking is on the way out. Although this method does have the advantage of producing good quality seed, it cannot compete with faster mechanical means.

One simple, but very effective, buffel seed harvester has been developed by Messrs. Kirby Brothers, of Bullindgie, Dirranbandi. This machine consists of a metal-bottomed gauze box which is attached to the front bumper-bar of a utility truck. The use of gauze on the top and sides of the box eliminates eddy currents that would otherwise disturb the harvested seed and cause some to escape. The front of the gathering box is covered with rabbit netting and horizontal wires.

The utility is driven through the mature seed crop at 4 to 6 m.p.h. The usual harvesting procedure consists of two runs over the crop at fortnightly intervals. Together, these give seed yield of 20 to 30 lb. to the acre. Harveste seed is later screened through bird netting t remove straw and grasshoppers. The cost o harvesting seed by this method has been worke out at 8d. to 1s. a lb. Other machines wi harvest more seed per acre but this is probabl the simplest to construct.

You can build this simple buffel grass see harvester in your farm workshop. Plans ar available free from the Department's head office William Street, Brisbane.

—*S. MARRIOTT,*
Assistant Director of Agriculture.

Makarikari Grass For Downs

Makarikari grass, a little-known but promising African pasture plant, has given encouraging results under grazing on the Darling Downs. Observations on a seven-year-old stand on a dairy farm at Pinelands point to its palatability, cold tolerance and quick response to rain.

The Minister for Agriculture and Forestry (Hon. O. O. Madsen, M.L.A.) said that the report on its performance under farm conditions in Queensland was based on a two-acre planting. This was laid down in February, 1953, under the supervision of Mr. R. G. Wilson, Adviser in Agriculture at Toowoomba. Runners and root divisions from the Department's Toowoomba pasture nursery were set out by hand in plough furrows spaced 3 ft. apart.

Mr. Wilson's report on the plot says that after seven years' experience, the landholder rates Makarikari grass as the best pasture plant on his property. He points out that it is more palatable than green panic, Gayndah buffel and lucerne, and he has had to fence the area to prevent overgrazing. Frosts cut back the top growth, but the stock still eat it. In only a moderate season, the grass will grow 5 ft. tall, but the stock will eat it back to the butts.

The report adds that Makarikari grass coul be an asset to any dairy pasture improveme programme on the Darling Downs.

Mr. Madsen said pasture research workers i the Department see a future for Makarikari gras if certain establishment problems are overcom They believe it could make a contribution b improving the winter feed in sub-tropical Queens land. Although Makarikari grass makes its mai growth in summer, it is one of several promisin summer grasses that have some cold toleranc In the winter when feed is scarce, Makarika grass is superior to buffel, Rhodes grass an some other species.

Shortage of seed is at present hindering wide testing. The grass flowers over a period o several weeks and the seeds fall as soon as the are ripe. Research workers are aiming to kee the seeds on the plant until all or most of ther are ripe.

Another possible means of mechanisin planting so the grass can be established in bi areas involves using a modified Bermuda sprin planter to plant runners and root sections. Fo a grass of such promise, investigations with thi machine could be worthwhile.

Guides To Beef Cattle Breeding

By G. I. ALEXANDER, Senior Husbandry Officer.

This article will give some idea of the underlying mechanisms in animal breeding which cause us to make the recommendations we do.

As you probably know, each individual receives half his inheritance from the male parent through the sperm and half from the female parent through the egg. When the sperm fertilizes the egg, then the individual has its complement of hereditary factors. These factors are called "genes" and occur in pairs, one from each parent. During successive generations, these factors get more or less mixed up so that the offspring of a parent do not look like either parent in every characteristic.

Most of the characteristics of economic importance in livestock are controlled by a large number of genes whereas factors such as colour and polledness are controlled by only a very few genes.

Another point of difference between the easily recognised characters such as colour and the characters which are important economically such as growth rate is that these latter characters are modified by the environment. That means that a red animal is a red animal in Queensland or Tasmania whereas a beast may grow well in Tasmania and not in Queensland or vice versa.

This makes it more difficult to select animals for economic characters than for things such as colour or polledness.

Heritability

However, there are ways of knowing how to select animals for performance. One aid in the selection of an animal for a certain characteristic is to know the *heritability* of that characteristic.

Heritability may be best described by an illustration. Say we were to use a bull which grew at the rate of 4 lb. per day on a group of cows which had gained at the rate of 1 lb. per day. Then, if growth rate were completely inherited, we would expect the offspring to grow at the rate of 2·5 lb. per day or exactly half-way between the male and female parent. In actual fact, this never happens. What we find is that the offspring will average about 2 lb. per day. Then the offspring can be said to perform at 1/1·5 or ⅔ of the level that they were expected.

If you convert this to a percentage, they only performed at 66 per cent. of their expected level. Thus the heritability of the growth rate in this hypothetical case is 66 per cent.

Heritability estimates vary considerably from place to place and depending upon such factors as the severity of the climate and pasture conditions, the degree of selection in a herd (or how highly improved the herd is), and the breed or breed-crosses being examined.

However, we can average out all these different heritabilities and arrive at a working guide for a breeder.

Now that we have the heritability estimates of these characters, how shall we use them to decide what to do?

Geneticists have found that traits with heritabilities above 30 per cent. can be as efficiently selected for in the individual as by a progeny

TABLE 1

HERITABILITY ESTIMATES FOR BEEF CATTLE CHARACTERS

Character	No. of Estimates	Average of Estimates	Range of Estimates
		Per cent.	Per cent.
Production Factors—			
Calving interval . .	3	8	0–15
Birth weight . .	15	41	11–100
Weaning weight . .	26	30	−13–100
Cow maternal ability	2	40	19–60
Post-weaning feedlot gain	13	45	19–70
Post-weaning pasture gain . .	6	30	9–43
Efficiency of feedlot gain	4	39	3–75
Carcass Traits—			
Dressing percentage . .	2	71	69–73
Carcass grade . .	5	34	−30–84
Rib eye area . .	3	69	69–72
Tenderness . .	2	61	41–82
Conformation Grades—			
Weaning	16	26	0–53
Slaughter . .	5	39	−13–63
Cancer Eye Susceptibility	2	32	23–41

test. This means that we can select bulls for their ability to get rapidly growing calves either by selecting them on their own growth rate or that of their calves.

If the heritability of growth rate were 66 per cent. as we worked out in our example earlier, then we can select the bull himself on his own growth rate and this will give us a good guide to the performance of his offspring.

Looking at the table now with the actual quoted heritabilities, we can see that all the characteristics quoted with the exception of calving interval have heritabilities in excess of 30. Thus they can all be selected for on the individual's own performance.

However, of course, carcass characteristics can only be evaluated in a bull's offspring since it is impractical to slaughter a bull to decide on his own carcass quality. Some day when semen can be easily stored for a long time this may even be possible.

Number of Characters to Select

If we wish to select only one character with a high heritability, then progress will be relatively rapid. However, if we wish to select more than one character, then the rate of improvement we can make in the herd is reduced proportionally. Thus it is important to keep the number of characters that you want to select at an absolute minimum and that the characters selected for are of the greatest economic importance.

What Goal to Aim For

If a breeder has in mind today one selection objective and then five years later he changes his mind and selects for some other type, then he will never make very much progress. It is important to decide upon a certain clear-cut objective and then select towards that objective without taking notice of fads and fashions. I feel that a commonsense objective for a beef breeder is to select stock which will produce as much edible meat as possible in as short a time as possible.

What Foundation Stock to Use

Selection will not create new genes nor cause genes to change. Therefore, it is important to commence your programme with as good foundation stock as possible. One of the principles in the foundation of new breeds has been to establish it on line crosses, strain crosses, or breed crosses. These provide sufficient genetic variation to give a good chance of rapid improvement.

Size of the Herd

The size of the herd is important for a man who is going to try to improve his stock. It is important to have a herd of sufficient size so that a mistake in the selection of a bull will not adversely affect the progress. If sufficient bulls are used and replaced rapidly then the rate of genetic improvement is greatest since we do not allow any one individual to play too great a role but rely on the average performance of bulls selected to lift the herd. If we wait until we strike the odd outstanding individual bull, then we may wait forever, so that it is preferable that we concentrate on a rapid turnover of bulls.

In order to do this, a herd size of about 100 head is the minimum to use so that three or four bulls are used at a time in any one season.

These points are only a few which should be considered. They represent some of the more significant points which a breeder of beef cattle must consider fully and which commercial men should be aware of when deciding where to purchase an animal.

Tobacco Pests Controlled In Seedbed And Field

By **W. A. SMITH** and **G. W. SAUNDERS**, Entomologists.

Queensland tobacco growers have to contend with pests which attack the roots, stems and leaves of the growing plants. Some of these pests are present on most farms every year and even on new farms it is almost impossible to grow a payable crop without the use of suitable control measures.

The following programmes outline routine preventive practices for seedbeds and early crop growth in the field, and indicate where observations should be used to regulate later treatments:

In the Seedbed

Prepare the seedbed site early and eliminate as many weeds as possible.

Before planting, sterilize the beds and paths by firing or fumigating to ensure nematode-free transplants.

After planting, spread a layer of medium grade river sand to a depth of one-eighth of an inch on the beds as a protection against seed-harvesting ants.

At the time of seedling emergence, search the beds closely for activity of leaf-harvesting ants. If this is evident spray the beds and paths lightly with endrin or dieldrin, and give the nests additional spray.

Two weeks after germination, or earlier if necessary, make light sprayings weekly with either endrin or dieldrin. The spray should be directed horizontally from each side and applied after the last watering for the day.

A day before lifting for transfer to the field, give the seedlings a thorough spraying with either endrin or dieldrin.

In the Field

Prepare the fields early to eliminate weeds and to obtain a good tilth.

To control nematodes, fumigate the soil with either EDB or DD at least three weeks before planting out.

For three weeks after transplanting, make weekly applications of a combined spray of either endrin and DDT or dieldrin and DDT.

Later spraying should be timed by observations on the presence of young stages of the pests. Applications of endrin at approximately 10-day intervals should prove sufficient if looper is present. DDT at weekly intervals is required while budworm is active; the DDT should be combined with endrin if looper also is present.

Crops planted for autumn picking should be given the early routine protection. Subsequent insecticide requirements are usually much less than those for fields harvested during the summer.

In south-western districts, jassids are kept in check by the routine spray applications while mites may be controlled during periods of activity by fortnightly applications of kelthane.

Nematodes must be considered early. Where soil working can be done carefully during the early life of the crop, the fumigant may be applied in rows 6 in. on each side of the intended planting line. Application in rows 1 ft. apart over the whole field, however, permits maximum lateral working of the soil. The double row treatment requires 10 gall. of fumigant to the acre, the complete treatment 20 gall. In each case the depth of application should be 6 to 9 in.

During recent seasons, leaf-miner activity has been high on some farms, and difficulties have been experienced in dealing with the pest in these proportions. Insecticide trials have been carried through with a range of new materials. The most promising of these is WL1650, a close relative of endrin. This material killed leaf-miner more quickly than standard recommendations but information in respect to other pests is incomplete. WL1650, therefore, may be of special value as a spot treatment for leaf-miner control should high activity be suspected or evident. It can be combined with DDT, endrin or dieldrin as required if other pests are present.

Either endrin or dieldrin will control the looper, leaf-miner, stem borer and cluster-caterpillar, but neither gives sufficient control of budworm. DDT will control budworm and also the other leaf and stem pests except the looper. WL1650 will control leaf-miner.

Weekly applications may be required to control heavy and persistent infestations of leaf pests. On no account, however, should it be necessary, nor is it advisable, to apply insecticides to tobacco more often than weekly, or at strengths greater than recommended.

Effective control of leaf-miner and looper depends to a large extent upon the method of application. Complete cover of both leaf surfaces is essential. This can be achieved only by using sufficient volume of insecticide, and paying particular attention to nozzle placement.

When budworm is prevalent the spray treatments, whether with DDT alone or as a combined spray, should be applied to protect the plant hearts. If this pest only is active, more rapid and economic protection can be obtained by confining the DDT to the upper portions of the plants.

Insecticides in emulsion form and spray strengths recommended are:

(1) Endrin, 0·05 per cent. active ingredient.

(2) Dieldrin, 0·05 per cent. active ingredient.

(3) DDT, 0·1 per cent. active ingredient.

(4) WL1650, 0·1 per cent. active ingredient.

(5) Kelthane, 0·05 per cent. active ingredient.

In any combined spray, each insecticide should be used at its recommended strength.

Soil fumigants and dosage rates are:

(1) EDB, 27·0 per cent. w/v or 12½ v/v*.

Treatment 6 in. each side of intended row position—10 gall. per acre, applied as 1 pint from each outlet of the machine to 4 chains. The same rate is used if 20 gall. per acre are applied in rows 1 ft. apart across the field.

(2) DD.—The material as commercially supplied is used at the same rates as for EDB.

WARNINGS

To avoid the risk of undesirable taints and residues, insecticides should be used on tobacco only when necessary. Dieldrin, endrin and WL1650 should not be used in excess of the recommended rates, particularly near harvesting.

A health risk is involved if dieldrin, endrin and WL1650 are inhaled, ingested or absorbed through the skin. Care should be taken to avoid inhaling these insecticides or being unduly wet by spray.

EDB and DD are skin irritants. Fumes from EDB in a poorly ventilated room are dangerous. Splashes of the concentrates should be washed off immediately with soap and water, and any clothes which are splashed should be changed immediately and not worn again until they have been washed thoroughly.

Scientific Names of Pests

Budworm . . .	*Heliothis armigera* (Hübn.) *Heliothis punctigera* Wallengr.
Cluster-caterpillar . .	*Prodenia litura* (F.)
Leaf-miner	*Gnorimoschema operculella* (Zell.)
Looper	*Plusia argentifera* Guen.
Mite	*Vasates lycopersici* (Massee)
Seed and leaf-harvesting ant .	*Pheidole anthracina* Forel.
Stem borer	*Gnorimoschema heliopa* (Low.)
Root-knot nematodes	*Meloidogyne javanica* (Treub) *Meloidogyne incognita* (Kofoid and White)

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* Use other formulations of EDB at equivalent rates.

Some Ways Of Establishing Glycine

By P. G. TOW, Agronomist.

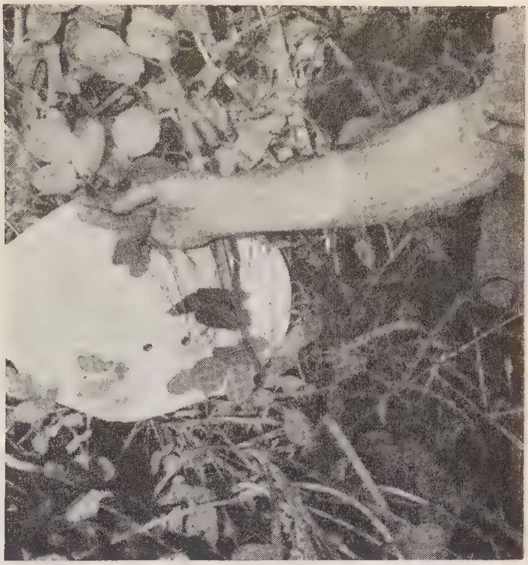


Plate 1: Glycine in a Green Panic-Glycine Pasture Mixture.

This article gives a brief account of some of the methods used to establish glycine, and mixtures of grass and glycine on the Kairi Regional Experiment Station. Although much work remains to be done to get the best out of such pastures, it can be said that they have been established with reasonable ease, and have shown their value for milk production beyond doubt.

The tropical legume *Glycine javanica* has shown promise as a pasture component in the mixed farming areas of the Atherton Tableland. It is palatable to stock, mixes well with a variety of grasses, and, when well established, has the capacity to provide nitrogen to the associated grass.

Nitrogen is the plant food which is most often lacking in pastures on the red soils of the Tableland.

Unfortunately, glycine is damaged by frost, but if adequate soil moisture is available, regrowth after frost is quite satisfactory. If it escapes frost, it produces seed prolifically.

Glycine has been grown at the Regional Experiment Station, Kairi, since about 1947. Seed has not been produced commercially to date except at experiment stations. Plantings have been increased on the Kairi Station in the last few years; in 1959, large areas escaped the frost and produced a prolific crop of seed. Many farmers have taken the opportunity to collect some of this seed for plantings on their farms.

Soils

Glycine grows well on the red clay loams that once supported rain forest. Where regular grazing does not occur, it will come up on its own, spread over the ground, and eventually grow over fences, shrubs and trees.

However, it will also grow on the poorer, more acid and lighter-coloured soils where eucalyptus forest once occurred. Such soils are scattered throughout the district on ridges or smaller outcrops. Growth on this soil is often slower and there have usually been spots (eroded patches and plough-outs) where the glycine has failed to spread at all. Therefore, it cannot be expected to do wonders on poor, "worked-out" maize soils.

Rate of Planting

While little has been done to compare rates of planting of glycine with grass, a rate of 3 to 4 lb. to the acre has generally been adopted and found satisfactory. As glycine has a creeping habit of growth, a thin stand from lower rates of planting will thicken up in time, but a good

Plate 2

Green Panic–Glycine Pasture Mixture.

stand right from the start will have more chance to compete with weeds and with heavy stands of grass.

Early Growth

Glycine appears to be a naturally slow grower in its first year. This has been found, not only at Kairi, but also in South Africa. The farmer, therefore, has to take this into account and he should give it every opportunity to establish and form a good cover.

This slowness of early growth is aggravated by the presence of weeds and grass. Reasonable weed control by mowing (or brushing and chipping of small patches) and avoidance of heavy grazings in the first year are highly desirable.

Of the methods used to establish grass-glycine mixtures on the station, some have been successful, others not. They may be divided into two groups:

(*a*) *Establishment of Grass and Glycine Together*

The normal practice in establishing a new area of grass-glycine is to work the ground to provide a fairly fine seedbed and to plant both species together through the grass seed box of a combine. The glycine will begin to germinate within a week, but the grass may take longer.

In 1957, a paddock which had been under maize for several years previously was ploughed and disced to give a seedbed, and planted to green panic and glycine in mid-February.

Vigorous weed growth gave the young pasture a setback, and thinned out the stand. Mowings were necessary in the first six months, but after this, the glycine made good headway.

The following year, a good mixed pasture was present, and it has continued to improve.

In early March, 1959, a mixture of Guinea grass and glycine was planted in a similar manner. Conditions for most of the year were ideal for weed growth, which was very strong. Four mowings were necessary in 1959, and this prevented the use of the pasture for grazing till the end of the year. Ten months after planting, the pasture was in a satisfactory condition, but care with grazing was still necessary to allow the glycine to develop a strong hold amongst the grass and to suppress weed growth.

(*b*) *Establishment of Glycine in an Existing Stand of Grass (Sod-Seeding)*

In establishing glycine in an existing stand of grass, a fine seedbed has not been found absolutely necessary. However, the stand of grass must be weak, or made weak by appropriate cultivation in order to allow the glycine to make good early growth.

In January, 1957, an area of land which had been under Rhodes grass for about 10 years was ploughed. The grass by this time was unproductive. Towards mid-March, the area was sundercut, and then planted to glycine. The seedbed was very rough, but the glycine germinated well in most parts, and grew sátisfactorily. Fortunately, weeds were not very bad, and mowing was not necessary till July.

By the next summer, the Rhodes grass had re-established itself in the area, and both pasture species were present in good proportions, though growing only slowly.

After storm rains, the glycine came away more slowly than the grass, but eventually gave excellent dense growth. A good mixed pasture has since been maintained without trouble.

In February–March, 1958, an attempt was made to improve three different stands of grass by sod-seeding them with glycine:—

(i) A year-old stand of Rhodes grass–lucerne in which the lucerne was rapidly disappearing, was sod-seeded with glycine. The grass stand was good, and its growth was moderately vigorous. Although a higher rate of seeding than normal was used, the strike of glycine was only fair. Plants developed a few leaves, and growth then remained at a standstill. Apparently, the grass offered too much competition. Plants have survived here and there but they have never made enough growth to form a good mixed pasture.

Plate 3

Glycine Grown for Seed.

(ii) A year-old stand of elephant grass was sod-seeded with glycine. The elephant grass was in rows about 4 ft. apart, and the glycine was seeded into the inter-row spaces. The elephant grass was quite vigorous, and the inter-row spaces had been invaded by vigorous Rhodes grass. A reasonably good germination of glycine resulted, but grass competition was evidently too much for it, and it died out.

(iii) A three-year-old stand of green panic had been allowed to grow tall and rank during the wet season. However, it was suffering from nitrogen deficiency, and the plants were weak. The stand population was only moderate. The grass was mown and raked off to remove any impediment to the sod-seeder, and the glycine then planted. Quite a good strike resulted. The green panic regrowth was not very dense, and this allowed the glycine to grow without much competition.

Frost and dry weather kept the pasture at a standstill after June, but a good mixed pasture resulted in 1959. A satisfactory effect was achieved in the same year in another thin stand of green panic by ripping the pasture with tines and then oversowing with glycine by means of a seed drill.

It is generally advisable to inoculate legumes with a culture of the correct strain of Rhizobium bacteria. Inoculum has not been used in planting at Kairi, as indications are that a satisfactory strain is present in the soil. However, cultures of inoculum for glycine are available free of charge from the Bureau of Tropical Agriculture, South Johnstone, and it would be advisable to inoculate at least some of the seed before planting.

In conclusion, it can be mentioned that many farmers are broadcasting seed which has been collected by hand and therefore mixed with a certain amount of soil, leaf and other trash. A few farmers are planting glycine runners because of the scarcity of seed. These plantings will be watched with interest.

bucket and bail

Cowpeas For Summer Milk.—Cowpeas have long been recognised as a valuable legume for green manuring. Their value as a stock feed has been largely overlooked, but with the excellent results being obtained on the Downs with this crop it may soon assume its rightful place as an extremely valuable summer legume.

The main advantage of legumes is their high protein content. They maintain this high protein content longer and do not become so fibrous as non-leguminous grazing crops. The sudans and sweet sorghums after their initial growth, and particularly in a dry spell, become very coarse and fibrous and consequently do not provide the high quality ration necessary for good milk production.

One farmer who has proven the value of cowpeas over other summer grazing crops and natural pastures is Mr. A. Harvey, of Kingsthorpe. By using cowpeas he increased his production during February and March by 35 per cent. to a level higher than he has obtained at any other season of the year. This is more significant when you remember that February and March are the months on the Downs when dairy production commences its seasonal decline.

Mr. Harvey planted cowpeas at Christmas time primarily as a soil improvement measure, but his herds production responded so well to them that they will now become an important part of his annual cropping programme.

The crop, planted towards the end of December was ready to graze on the first of February. As it was very lush, some difficulty with bloat was experienced and only limited grazing could be allowed. Nevertheless production from Mr. Harvey's herd of 25 head rose from 44 to 59 gal. a day. After a fortnight, when bloating was controlled and continuous grazing was given, production rose still further to 64 gal. a day.

It is estimated that the increase in production during this period was worth about £100, and the crop was still supplying the bulk of the herd's requirements at the end of March.

Mr. Harvey is quite sure that from the other feed he had available, crops and pasture, his production without the cowpeas would not have risen over the 44 gal. and most probably would have fallen.

One acre of cowpeas to each cow is a good allowance for full feeding and the effective grazing period of this crop can be extended by making a succession of sowings.

Cattle may be slow to commence eating cowpeas at first but they soon overcome this and eat them readily. There is also a danger from bloat if the crop is young and lush but this can be overcome.

—J. A. ONLEY,
Adviser in Cattle Husbandry.

Did You Carry Any Passengers?—It pays to examine the milking history of your herd. These cows are your main income units. What they have produced has determined the efficiency of the farming business.

Most important will be how long each cow has milked. Unless this was of the order of 9–10 months then you certainly have had some passengers. There are two main reasons why cows may have had short lactations.

Primarily there has been a feed deficiency. This has occurred through cows calving too early or too late to catch the full benefit of the seasonal flush of natural pastures or because they were not adequately fed during that critical dry period immediately prior to calving. This in turn influenced their later production period.

The second reason for short lactations would be failure to "take" during service, thus calving at the wrong period of the year, suggests breeding problems.

While the provision of adequate feed at the proper time is one of the major tasks of a dairy farmer, the systematic control of mating is a valuable and relatively simple means of influencing length of lactation. The provision of a special bull paddock and recording of service dates will be a major step towards increasing herd production.

—*W. D. MITCHELL, Dairy Technologist.*

After-Calving Paralysis.—Milk fever is not the only cause of freshly calved cows being paralysed in their hindquarters. But it is the most common, and affected animals usually recover quickly after an injection of calcium borogluconate.

Cows paralysed in their hindquarters will fail to respond to calcium borogluconate injections if some other disorder is responsible.

Besides milk fever, other common causes of paralysis after calving are:—Acetonaemia, injury to the pelvis or sciatic nerve, dislocation of the hip, leg fracture, and toxic mastitis. Unless the cause of the disease is obvious, it is desirable to call in a veterinary surgeon.

Acetonaemia is an upset that may be brought on by the stress of calving, though it may also occur independently of calving. In this disorder instead of the carbohydrate reserves such as fat being converted to blood-sugar, acetone is produced. This causes a wide range of nervous symptoms that usually end in paralysis.

Correction of this condition requires the injection of sugar into the bloodstream and drenching with glycerine. Cortisone has also been used effectively by veterinary surgeons.

Cows will usually recover in a few days from paralysis caused by injury to the sciatic nerves. This disorder is caused by excessive pressure injuring the two trunk nerves to the leg muscles.

An acute attack of mastitis may cause a cow to remain down after calving. Unless she is examined carefully, this condition may be overlooked.

Injury to the pelvis and fracture of the thigh bone will also prevent the animal from getting up. If the hip is dislocated, the intense pain will prevent the cow from attempting to rise. These conditions are usually difficult to diagnose, and your safest course it to consult a veterinary surgeon.

—*O. H. BROOKS,*
Divisional Veterinary Officer.

Slow Milking.—Don't let faulty milking machines or out-of-date milking methods rob you of fast milking. Each milking machine unit should milk at least 12 cows an hour. If you're falling short of this average, the efficiency of both your milking machine and milking methods needs overhauling.

Fast milking is a real time-saver. And time saved in the dairy can always be employed profitably on other farm jobs.

Quick milk let-down is the first requirement of fast milking. You get this by handling your cows gently and by training them correctly. Let-down is stimulated by washing the teats and udders thoroughly with warm water. Addition of a chlorine solution to the udder wash helps to check the spread of mastitis. Let-down lasts from four to six minutes, and your milking machine must be operating efficiently to remove the milk in that time.

Like any other machine, a milking machine needs regular maintenance for continued efficient operation. It has been shown that a fluctuating vacuum will bring discomfort to a cow and reduce the milking rate. This fault is most commonly caused by air leaks or a dirty vacuum relief valve. Ensure a constant level of vacuum by sealing off any air leaks and cleaning the vacuum relief valve regularly. Effective oil wicks are necessary to make sure that an adequate oil supply reaches the internal surfaces of the pump.

You'll run into slow milking troubles also if the pulsators are not set and serviced according to the manufacturer's instructions.

With effective let-down and efficient milking machines, most of your cows can be trained to machine stripping. This permits faster milking and removes the risk of spreading mastitis from the milker's hands.

If you're in any doubt about the efficiency of your milking machine, consult your local Dairy Officer. With equipment provided by the Queensland Dairymen's Organisation, he will check your milking machine free of charge. He will also advise you on modern milking methods and machine stripping.

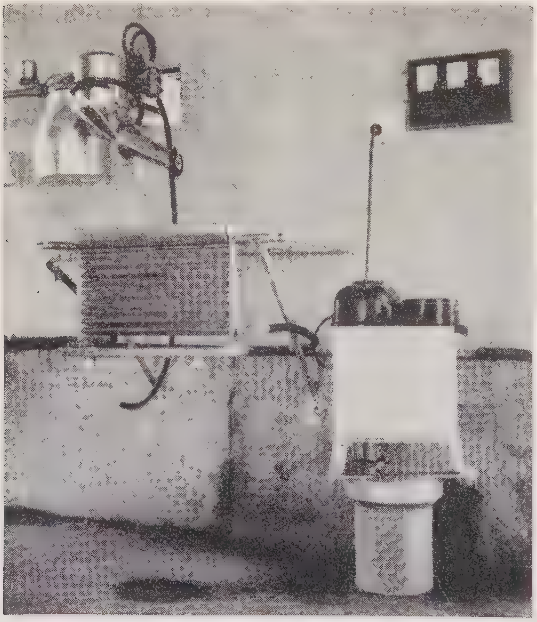
—*E. W. COSTELLOE, Dairy Officer.*

Handy Hints For The Dairy Shed

By P. McCALLUM, Senior Dairy Adviser.

Hints that can save time and labour in the milking shed will be welcomed by most dairymen. Manufacturers with an array of household appliances are continually striving to make the daily lot of the housewife much easier, so why not make the 365 days a year dairy routine a lot easier? It can be done in many ways.

Mr. J. C. Naylor, Ferny Grove, who recently erected a new milking shed, incorporated several ideas which make the daily cleaning routine much easier. These ideas may have application on other dairies.

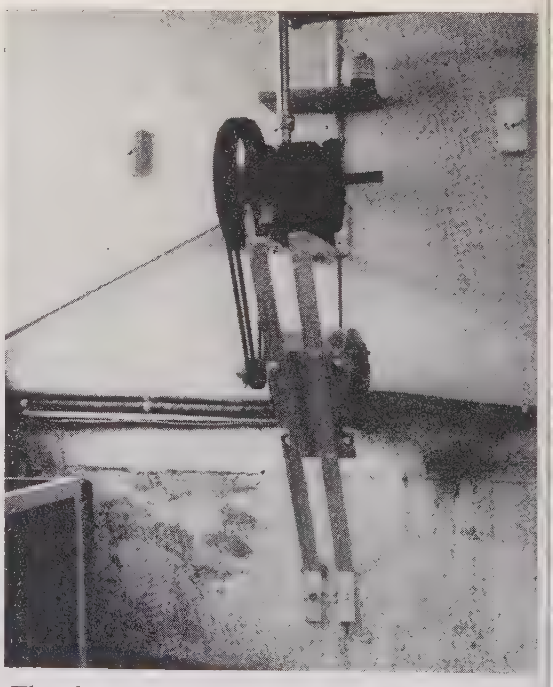


A glazed earthenware pipe was used to make the separator block (Plate 1). This pipe was set into the concrete floor and then filled with concrete. A steel plate was attached firmly to bolts previously set in the concrete and the separator was then bolted to this steel plate. This provided a neat, easy to clean, separator block.

A 12-in. diameter untested earthenware pipe can be purchased for approximately 22s. from most hardware merchants.

Other features worth noting in this pictu are the 2 ft. 6 in. high concrete wall betwee the separator room and the first bail, and th tubular metal stand for the milk vat and mil cooler. This vat stand is braced onto the dwa wall.

The floor of the separator room can be furthe freed of obstructions by attaching the electr motor and vacuum pump to the wall with met brackets (Plate 2).



The fittings described provide more space i the separator room and make the daily cleanin operations so much easier.

Action To Prevent Tetanus In Stock

By C. P. CRAVEN, Divisional Veterinary Officer.

While tetanus is encountered in all classes of farm stock in Queensland, most cases are seen in horses and sheep. Cattle and pigs are not so commonly affected, some cases are recorded in dogs, and one case has been seen in a goat. The disease is characterized by excitement and increased tone of muscles which produces a characteristic stance and gait.

Tetanus is caused by a germ (*Clostridium tetani*) which is an inhabitant of soil, both cultivated and uncultivated. It is commonly found in the manure of most animals, particularly horses. The germ appears first as a slender rod but later develops into spherical spores.

Method of Infection

Infection in all animals occurs as a result of wound contamination. Clean wounds rarely result in tetanus. It is the dirty wound containing foreign material, particularly soil, that is most dangerous. Deep penetrating wounds are much more dangerous than superficial ones. When soil accompanies tetanus germs into a wound, it paves the way for the multiplication of the germs, and the setting up of tetanus. The germ begins to multiply in the wound area and in so doing produces a toxin or poison which is responsible for the symptoms shown. The local effects of the tetanus germ in the wound are negligible; the principle agent in the production of the disease is the toxin, which is one of the most poisonous substances known.

How the toxin produces symptoms of tetanus is not definitely known. It is thought, however, that it is absorbed by nerves near the wound and then passes along these nerves to the brain. It is thought that the general symptoms of the disease are produced when the poison reaches the brain.

Incubation Period

Incubation is the period which elapses from when the germ enters the wound until the first symptoms of tetanus are seen. This is commonly one to three weeks, but in some cases may be longer. Thus in sheep, it is common to see cases of tetanus one to three weeks after castration or tail docking.

Symptoms

Horses.—Tetanus usually occurs in horses following some sort of injury, such as a nail prick in the hoof, castration, injuries caused during breaking in, and stake wounds. Frequently, however, no wound can be seen. It is possible for such wound to have occurred internally, for example, in the tissues of the mouth.

In the horse, the first symptom seen is stiffness, followed by rigidity of the muscles. This often begins first in the muscles of the head and produces "lock-jaw". The horse may then have difficulty in picking up food, masticating it and swallowing it. There would be a resultant drooling of saliva. An early symptom seen is the third eyelid protruding across the eye. This may be induced by throwing the head upwards. Normally the third eyelid retracts immediately the head returns to normal but in tetanus retraction is very slow.

The horse will have a straddly gait, forefeet may be picked up quickly, tail held out stiffly, ears pricked stiffly and head and neck extended. He will be excited easily. Sweating, and trembling of the muscles, are seen. Noise or movement induces spasms, and the horse may go down and be unable to get up. Temperature is normal in the early stages but later because of spasms, may go up to 110 deg. F. Death occurs in about 80 per cent. of cases, usually within 10 days of the onset of symptoms. Some may recover in three to four weeks.

Cattle.—Tetanus is not common in cattle but cases are seen usually following calving in the cow, or after castration in calves. Symptoms are similar to those in the horse. There is rigidity of muscles, stiffness and extension of the head and neck; toes are widely spread. The tail may be held in a raised position and the third eyelid protrudes over the eyeball when the animal is disturbed or frightened. Bloat frequently occurs.

Sheep.—Tetanus commonly follows lamb marking or shearing. It has also followed penetration of the skin by grass seed. It has been seen in young rams following the shedding of temporary teeth and it is thought that infection gains entrance to the body through the tooth socket.

When tetanus follows an operation such as lamb marking, the first cases are seen usually about a week later and losses can be heavy.

Lambs may be unable to suckle and they may have a grinning facial expression due to the contraction of the muscles of the face, Head is held high and the legs wide apart. Affected sheep are found with legs and head thrown back. If touched, the whole body stiffens. In early cases, there is stiffness in walking and a raised carriage of the head, the animal appears sick and is unable to eat properly. Again the third eyelid protrudes from the inner angle of the eye. Bloating occurs rapidly. Death can be as early as 24 hours after the onset of symptoms.

Pigs.—Tetanus is seen in pigs usually following castration. Symptoms are very similar to those already described for the other animals. The muscles are rigid and animals remain standing. Gait of the affected animal is similar to that already described. Affected pigs are excitable and exhibit "lock-jaw".

Dogs.—Tetanus in dogs is uncommon. Th most characteristic signs are elevation of the ea and furrowing of the skin of the forehead due t contraction of muscles; also the third eyeli will protrude across the eye.

Post-Mortem Appearances

There is no abnormal change produced b tetanus seen on post mortem in any anima which has died from tetanus. Consequentl a post mortem is useless in determining th cause of death.

Diagnosis

Diagnosis in all animals is based on th symptoms exhibited by the affected animal. Th contraction and rigidity of muscles, the peculia gait, and the behaviour of the third eyelid ar all quite characteristic of tetanus. The genera appearance of an advanced case is quit unmistakable.

Treatment

Treatment is usually attempted only o valuable horses, and other stock which the owne considers warrants a degree of expense and tim Treatment consists of injections of the moder tranquiliser drugs to relax muscles, and also man injections of large amounts of tetanus antitoxi Even with treatment many cases fail to respon It is wise to obtain the help of the loca veterinary surgeon if treatment of a tetanus cas is contemplated.

Prevention

Tetanus can be prevented by inoculati healthy stock against the disease. There are tw forms of inoculation. One gives the anim immunity within a few hours of injection an maintains immunity for two or three week Thus, if an operation such as castration horses or sheep is contemplated, at the time castration these animals can be inoculated wit **tetanus antitoxin** during the operation; th chances then of their getting tetanus are ver slight. Also if a horse has been staked or cu by wire, a tetanus antitoxin inoculation withi 24 hours of the injury will reduce considerabl the possibility of tetanus setting in. The dose of tetanus antitoxin are as follows:—To horse foals and cattle from 500 units; to sheep, pigs dogs 100 units. The injection is given under th skin. No undesirable reaction will follow th injection.

The other form of inoculation gives the animal a lifetime immunity but this takes about 14 days to develop. It consists of injecting **tetanus toxoid** under the skin. The dose for horses, foals or cattle is 10 c.c. and this may be followed in 12 months' time by another 10 c.c. and immunity will then be solid. For sheep or lambs, one dose of 1 c.c. is required. There will be a swelling at the site of injection but this will disappear later. Both tetanus antitoxin and tetanus toxoid are available at a very cheap price from the Commonwealth Serum Laboratories' representatives in a number of the larger towns in the State.

Both products can be used simultaneously, injected into the animal at two different sites. Thus the advantages of both can be obtained, giving the animal an immediate as well as an enduring immunity.

How Long Has Your Cow Been Milking?

The monthly progressive production sheet is forwarded to members of the Herd Recording Scheme every month. It shows the length of time each cow has been milking and the production for that period. On the bottom of the sheet is shown the average daily production per cow for the month.

This sheet enables the owner to see at a glance how long each cow has been milking and her production to date. It is particularly useful for comparing the production of animals which calved at the same time of the year.

Reference to this sheet in conjunction with the Monthly Herd Record Sheet and Shed Sheet will indicate cows which should be dried off.

Drying Off

The monthly record sheet is a very valuable guide in determining when to dry off a cow. All cows should be dried off within six to eight weeks of calving irrespective of the amount of milk and fat they are yielding. Thus a decision of this nature is easily made providing service dates have been kept and the date due to calve listed. However, the case of low producing normal cows requires more consideration. If feed is plentiful it is generally advisable to continue milking such animals. Drying them off will not increase the feed used by other cows, and though their yields are small they still add to the gross cash return without any appreciable increase in the cost of milking them. Sometimes such cows sustain a moderate yield for a long time and may surpass others in production that give a big flush and dry off prematurely. Should the animal's yield, however, tend to decline or keep at a very low level she should be turned out when feed starts to fall off, as the good cows in the herd can utilise the extra supplies.

Short Lactation Cows

The monthly progressive production sheet is particularly useful in showing short lactation cows. These animals are usually unprofitable because of their low production and the long time they are dry and therefore unproductive.

Check On Bulls

The monthly progressive production sheet gives an early indication of the productive ability of a bull's daughters. If you have a first crop of heifers by a certain bull, you will be able to see how they compare with other cows in the herd after three or four months. Naturally the best information is obtained by a comparison of completed lactation records, but an early indication is desirable as one can then decide whether or not to retain the bull.

AN ADDITIONAL SERVICE

The Herd Recording Section is now in a position to assist group members in the selection of a pure bred sire.

If you advise head office of your requirements (that is, breed, age of replacement sire), members of the breed who are recording will be advised of your requirements. Breeders will be asked if they have a sire they consider would suit you. They will be requested to advise you of details of price and breeding.

When you receive this information, forward the breeding particulars to head office and all relevant details of production will be extracted from our records and returned to you. This will assist you to narrow your choice down to two or three sires. It is recommended that you visit the properties if possible so that you can inspect the sire, his dam and sisters. You will also have an opportunity for discussion with the breeder and note the standard of management on the farm.

This Department of course will NOT enter into discussions respecting purchase price as this is a matter entirely for yourself and the breeder.

Low Cost Dairy Hot Water System

By **D. K. HOGAN, Dairy Officer.**

The device explained in this article enables water to be heated at a dairy where electricity is not available. The capacity of the boiler is in the vicinity of 36 gal. Fuel used is wood and its consumption is low. Heat retention is high.

The unit described is at present in use in the Proston district. Where the farmer can do the installation work himself, the cost of construction is about £12.

Materials required are:

- 400 new or used bricks, in clean condition (72 fire bricks if desired).
- 1 x 44 gal. heavy steel petrol drum, with two bungs on front top.
- 2 bags cement.
- 2 bags slaked lime (if desired).
- 1½ cu. yd. fine sand.
- 3 ft. of ¾ in. galvanised piping threaded both ends.
- 1 x ¾ in. T piece (or elbow).
- 1 x 2 in. galvanised bend (male and female fittings).
- 2 sq. ft. of galvanised iron and some solder (funnel).
- 2 x 3 ft. lengths of 3 in. flue piping (fibrous cement preferred).
- 1 x ¾ in. tap.

Method of Construction

The first step is to lay a concrete foundation 5 ft. by 3 ft. in a position close to the outside dairy wall. Allow this to set hard. If it is desired to reinforce the corners of the completed unit, right-angled plate iron should be embedded in the foundation for final connection with tie rods when all the external brickwork has been completed.

When a boiler is used regularly inclusion of reinforcement in the concrete foundation has been found desirable to prevent severe fracture. The most usual material is round steel ½ in. or ⅜ in. weldmesh but K-wire may be included where the weldmesh is not readily available.

Next construct a brick fire box upon this foundation 5 ft. long and 11 in. wide, inside measurement. Build to a height of at least 15 in. from the foundation (see Plate 1).

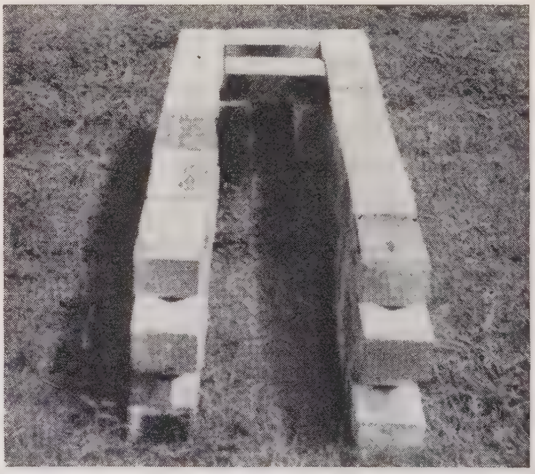


Plate 1

The Brick Fire Box is 5 ft. Long and 11 in. Wide.

The usual practice with brick construction where heat is present, for example, in a fire box, is to provide special fire bricks. This will ensure a more permanent structure.

While mortar for bedding bricks in this unit was a mixture of cement and fine sand, the addition of slaked lime would have been advisable to prevent any shrinkage and cracking under severe heating. A mix of 2 parts of cement, 2 parts of lime and 1 part of fine sand will provide a desirable mortar.

Place the drum on the top of this fire box, lengthways, 6 in. from the front end of the bricks, leaving the portion behind to form the chimney space. The small bung of the drum should be at the bottom and the large one at the top in front (see Plate 2).

The gaps between the drum and the fire box bricks are now packed with a stiff mixture of cement. All other openings no matter how small should also be filled, with the exception of the chimney space. This directs all heat towards the drum surfaces sealing the top of the fire box.

The pipes and large elbow should now be fitted into place. The $\frac{3}{4}$-in. pipe is the draw off outlet and is screwed into the small hole at the bottom of the drum. The 2-in. elbow forms part of the filler line and is fitted to the large plug hole. A suitable funnel can be prepared and soldered onto this elbow later.

The external brick walls are now built up from the edge of the concrete foundation all around the drum and fire box, until at least one brick higher than the top of the drum. This forms a wall all around the fire box and drum, leaving a cavity up to 4 in. wide between the two constructions (see Plate 3).

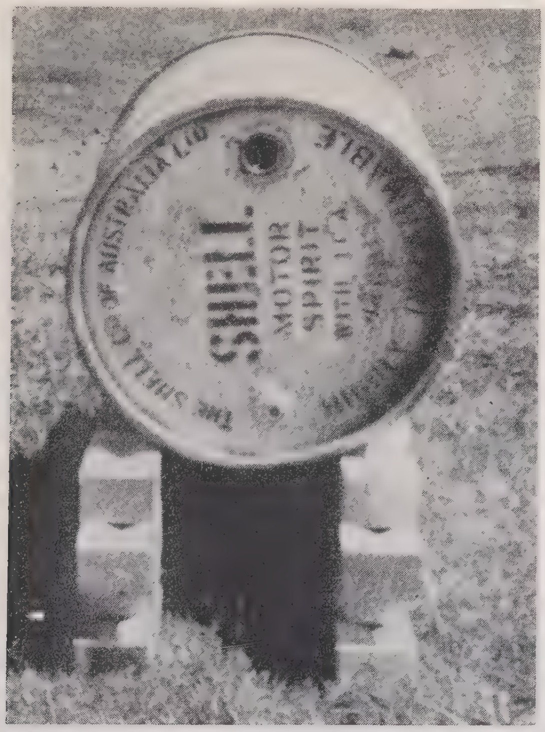


Plate 2

The Small Bung Should Be at the Bottom and the Large One at the Top.

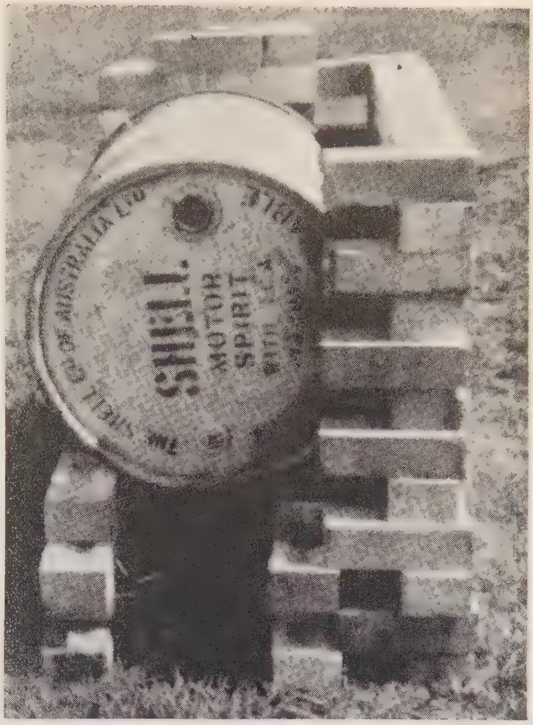


Plate 3

Forming a Wall all around the Fire Box and Drum, Leaving a Cavity up to 4 in. Wide Between the Two Constructions.

The chimney and the front of the drum can also be built at the same time. When sealing the front end it will be necessary to allow sufficient space in the brick work for the pipe fittings. All bricks should be toothed at the corners to give added strength. A brick on a tom suspension or an iron bar for support will be necessary to begin the front wall because of the opening which is left in the fire box.

The cavity so left after building to above the drum is next filled with dry sand and packed as tightly as possible until all spaces are filled. Cover the uppermost part of the drum with sand until a brick top can be laid level across the top of the whole construction, totally enclosing it.

The chimney can now be completed. In this unit a length of fibrous cement flue is cemented into place. It will be necessary to provide sufficient height in the flue to allow the fire to draw.

The whole system is now totally enclosed and should appear like a brick box with a covered top. A tap is fitted to the smaller ¾-in. draw off pipe and a funnel to the 2-in. elbow fitting. If desired, these fittings can be sited inside the dairy by attaching an appropriate short length of piping. While this adds greatly to convenience of operation it will be necessary to lag the hot water draw-off line to prevent a serious drop in water temperature when water is being withdrawn.

Plate 4
The Chimney is Constructed.

Curing

As this heater is composed of bricks and mortar it should be allowed to cure for at least a week before being used. On lighting the first fire do not stoke too heavily, rather let the heat increase gradually.

Filling the Boiler

Filling of the heater should be to within 6 in. of the top of the drum. Do not on any account overfill the drum or close off all vents. Leave the filler funnel open for the steam to escape. The funnel can be covered loosely with a perforated gauze cover when not in use to prevent the entry of foreign material.

A water level gauge may be fitted in this simple manner. Using a T piece in the draw off pipe, connect another short length of pipe in a vertical position to the height of the water level required. Leave the top of this pipe open and it will overflow when the heater has sufficient water in it. A certain amount of water will be lost from this gauge pipe as the water is heated.

The first time the heater is lighted it will take some time for the water to boil. This is due to the bricks being cold. Once they have absorbed heat it will be found that very little additional fuel will be required to keep the water on the boil.

A general recommendation to keep the water hot for many hours is to refill and stoke again immediately after use.

There is very little need to cut fine wood to use in the heater; it works very well on large, long billets. As a safeguard against rust it will be found helpful to add to the drum once a week about ¼ lb. of washing soda.

This type of farm heater has several major advantages: the capacity is large; the installation cost is low; fuel costs are low, and hot water is available day and night.

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Plans For August

Commence training heifers to ensure good milk let-down.

Tattoo calves for future identification.

Control grazing on weed-infested paddocks to minimise milk taints.

Join a Herd Recording Group now to find out which cows are profitable.

Overcome low fat milk by correct feeding. Consult your dairy officer.

Graze springers on good pastures and crops.

Records Saved Herd Slump

A set of scales and a butterfat test saved a Beaudesert dairyfarmer's breeding plan from disaster.

The farmer, Mr. H. H. Draper, of Cryna, was a member of a herd recording group. This meant that every month a herd recording officer came to his farm and measured the milk and butterfat yield of each cow. Results of these tests unmasked Mr. Draper's bull as a herd wrecker instead of a herd improver.

Mr. Draper said that, in this bull, he had thought he had the sire of a lifetime. On appearance, the bull measured up to everything that a Jersey bull should. And his calves—never had Mr. Draper had better-looking, healthier heifers!

But when they calved and joined the rest of the milking herd, production records showed that their yields were always below herd average. Next season they were just as disappointing.

"I quickly got rid of that bull and his heifers," said Mr. Draper. "If I'd reared replacements from those heifers I would have pulled down my herd's average instead of raising it."

Mr. Draper is certain that it was the information supplied by herd recording that enabled him to correct his breeding plan before too much damage was done. At the same time, it saved him a continuing loss in production, for it costs no more to run a good cow than it does to care for a low producer.

Mr. Draper said he culls his cows regularly. First he takes into consideration the disease history, present health and dairy temperament of the animal. Then he checks their production performances from his records and makes his decision.

Good Feeding

In obtaining high yields from dairy cows, Mr. Draper regards good feeding as essential. On his 217-acre property he has 60 acres of cultivation. He keeps 20 acres under lucerne and uses the remainder to grow maize and grain sorghum in the summer and a mixed crop of oats and golden tares for winter grazing. At present about 10 acres of his cultivation is under improved rain-grown pasture, a mixture of green panic and lucerne.

Four years ago he amply demonstrated the value of irrigated pasture in raising dairy yields. In 1955–56, admittedly a good season, he got his first grazing from 11 acres of irrigated pasture. The average yield from his 33-cow herd was 190 lb. of butterfat a head, 30 lb. better than the previous year's.

Although 1956–57 started well, the season later turned dry, and his irrigation water supply in a creek dried up. That year his production was 176 lb. In the drought year of 1957–58, production slumped to 143 lb. a head.

It was then that Mr. Draper began to concentrate on lucerne, both for hay and grazing. This change paid off with production up again to 171 lb. of butterfat a head last year.

"On a place like mine, where I haven't got a lot of water, I find lucerne is the best proposition," he said. "I use it for grazing, and in the good times I cut it for hay."

Mr. Draper said that as a cream supplier he did not believe it paid to feed concentrates. He feeds lucerne chaff almost the whole year round. At present he is feeding about 2 lb. of lucerne chaff a day to each of his cows.

His fodder reserves are 3,000 bales of lucerne hay and 60 tons of sudan grass—cowpea silage put down three years ago. He hopes to build up his lucerne hay stocks further before the winter.

As well as his dairy, Mr. Draper also runs a successful piggery. He relies on skim-milk and home-grown maize as his chief source of pig food.

Safe Use Of Portable Handlamps And Extension Leads

Handlamps and extension leads are very useful adjuncts in the home, in the garage, in the workshop, and, in fact, in any location where temporary illumination is required; but there have been too many instances of electrical accidents recorded in which the users of "home-made" leads have received electric shocks, some, indeed, with very serious and even fatal results.

"Home-made" leads are dangerous, and you should protect yourself and others by avoiding their use.

Safety can be very readily secured. If you need light to work under the house or in your garage or any other place, it is a very simple matter to purchase a portable handlamp at a small cost from your electrical contractor or reputable electric retail store.

You will be sure that you are buying a satisfactory article, as portable handlamps are "prescribed" equipment under the Electric Light and Power Acts, and must not be sold without the prior approval of this Commission.

When making your purchase, always ask for an approved article.

If the handlamp you buy is not already made up complete with flexible cord and connecting plug, buy the cord (heavy duty tough rubber or plastic sheathed type) and the plug, and have a certificated electrician assemble the complete lamp.

Do not use light duty (vacuum cleaner type) or figure of eight flex.

Do not attempt to make up your own flexible lead.

Another frequent cause of electrical accidents is the use of perished flexible cords and broken or chipped accessories (apparatus connectors and plug tops and plug sockets). If any of these start to show signs of wear, have them replaced and reassembled by a certificated electrician. It is not a job for the amateur.

—State Electricity Commission.

Working Horses at Toorak Field Station in the Julia Creek Area.

Help Sick Stock With Farm First Aid . . . They Deserve It

By O. H. BROOKS,
Divisional Veterinary Officer.

Prompt emergency treatment of sick or injured stock on the farm or station will often save the life of a valuable animal. The measures taken in the interval between the onset of attack and the arrival of a veterinary surgeon can have a direct bearing on the chances of recovery.

At the same time, emergency attention can spare the beast prolonged suffering.

Many farmers and graziers are too far removed from veterinary assistance and chemists to obtain immediate help for acute upsets in farm animals. For this reason, an emergency supply of non-perishable antidotes, drugs and first aid instruments should be kept on farms and stations.

The common stock ailments that require immediate attention for treatment to be effective are bloat, cyanide and arsenical poisoning, milk fever, grass tetany, tick fever, injuries and stake wounds.

These notes are not intended to take the place of expert veterinary assistance, but rather to enable the stockowner to take some practical steps to alleviate the trouble if there is any delay in securing assistance.

Bloat

If bloating is excessive, the cow is usually found lying on its side gasping for breath. The severe gas tension must be relieved with a trocar and cannula inserted at the highest point of distension on the *left* side. This usually is a point half way between the last rib and the hip and equidistant from the loin. (Plate 1.) The hair should be clipped and the skin cleaned with methylated spirits. A small "nick" through the skin with a pocket knife or razor blade allows the trocar and cannula to be inserted easily into the paunch. By a forceful push the cannula is inserted to its full length.

The trocar is removed and after the tension has been relieved the trocar is reinserted and the trocar and cannula withdrawn. If the bloating is severe the cannula can be left in position until the crisis has passed.

An anti-ferment should be poured into the paunch before the cannula is removed. There are several proprietary remedies available for the treatment of bloat. One ounce of kerosene or turpentine may serve in an emergency.

If a trocar and cannula is not available a pocket knife can be used, but can cause subsequent complications if some of the paunch (rumen) contents escape into the abdominal cavity. The knife should be held in position until the pressure has been relieved.

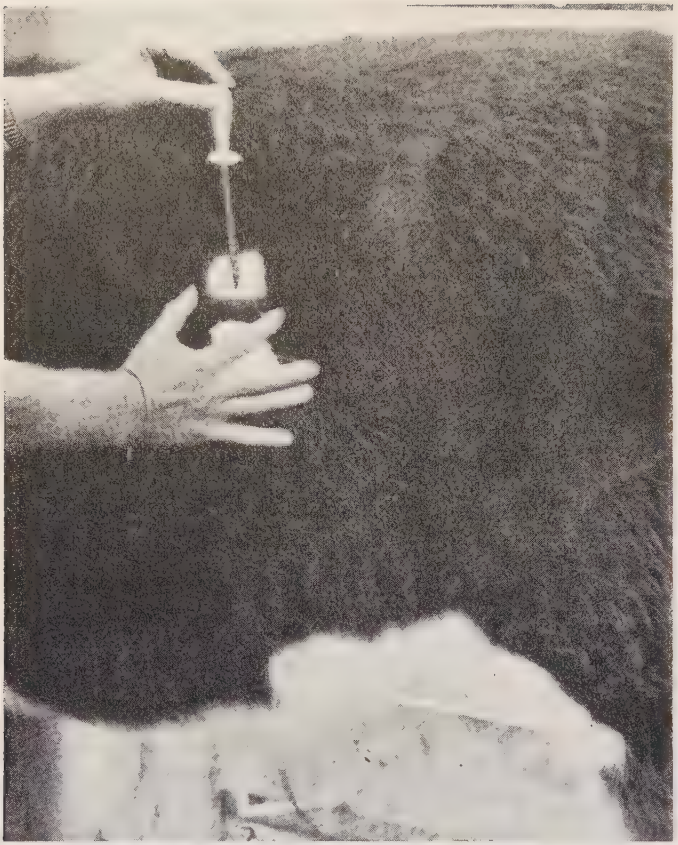


Plate 1

Puncturing the Paunch with a Trocar and Cannula will Relieve the Gas Tension in Severe Cases of Bloat. The point of entry is on the left side, about equidistant from the last rib and hip and a similar distance from the edge of the loin.

An effective farm remedy is 1 oz. of turpentine, eucalyptus or kerosene, in a cup of paraffin, linseed, castor oil or warm dripping.

A broom stick tied across the mouth like a bridle bit will often allow a cow with a mild attack to belch up the excess gases. Contrary to popular opinion, hypo is useless for bloat treatment, but is a specific antidote for prussic acid poisoning. This poisoning may produce bloat due to paralysis of the stomach muscles.

Prussic acid poisoning arises from cattle and sheep eating weeds containing prussic acid, usually under abnormal conditions. It can also be caused by crops of the sorghum family. Recently it occurred after linseed had been fed. Prussic acid poisoning, also known as HCN or hydrocyanic acid, causes sudden deaths and only prompt drenching will save animals which have consumed lethal quantities of plants or seeds. The specific antidote is photographic hypo (sodium thiosulphite). A delay of half an hour before drenching could result in a failure to use the antidote effectively.

Cattle require 2 oz. of hypo given as a drench in a bottle of water. Sheep require ½ oz. This dose may have to be repeated in half an hour if the animal is still showing symptoms. Hypo is not poisonous and can be measured by hand or in a tablespoon. One small handful of hypo would be approximately 2 oz. A tablespoonful is about ½ oz. Hypo can be purchased in 1 lb. sealed tins and will keep indefinitely.

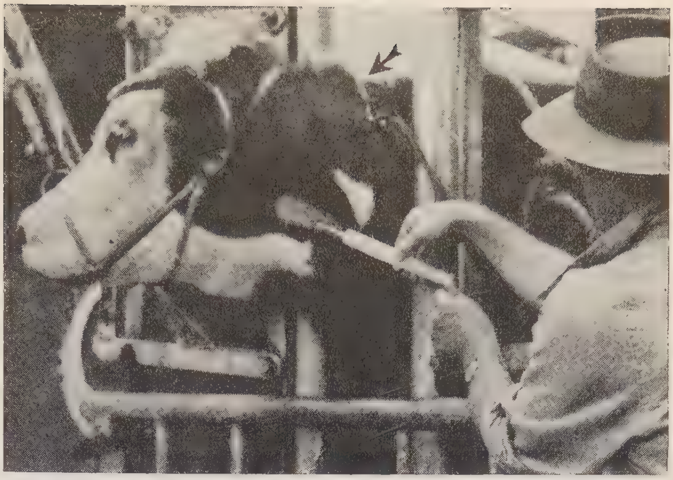
Remember that an animal affected with prussic acid poisoning may have difficulty in swallowing. Pour the drench slowly into the side of its mouth with its head tilted slightly upwards.

Arsenical Poisoning

Hypo is also an antidote for arsenical poisoning, but is not so effective as for prussic acid poisoning. Arsenic absorbed through the skin or bowels is passed out through the kidneys and

Plate 2

Intravenous Injection by Means of a Syringe. A tourniquet (see arrow) is used to distend the jugular vein.



the hypo has the effect of assisting excretion and delaying absorption.

Prompt drenching with hypo can save cattle. Two ounces given as a drench at four-hourly intervals are necessary until evidence of poisoning has disappeared.

If the arsenic has been taken by mouth, cattle should be drenched with oil such as paraffin or linseed, using 2 pints for adults. If eggs are plentiful, half a dozen whites given in milk will help to soothe inflamed membranes.

If a veterinary surgeon is available, he can administer calcium versenate which is more effective than hypo.

Milk Fever

Most dairyfarmers are familiar with milk fever and keep supplies of calcium borogluconate solution on hand. Where cases do not respond immediately to one injection, a second should be given within an hour. Advanced cases and large cows should receive a double dose from the outset.

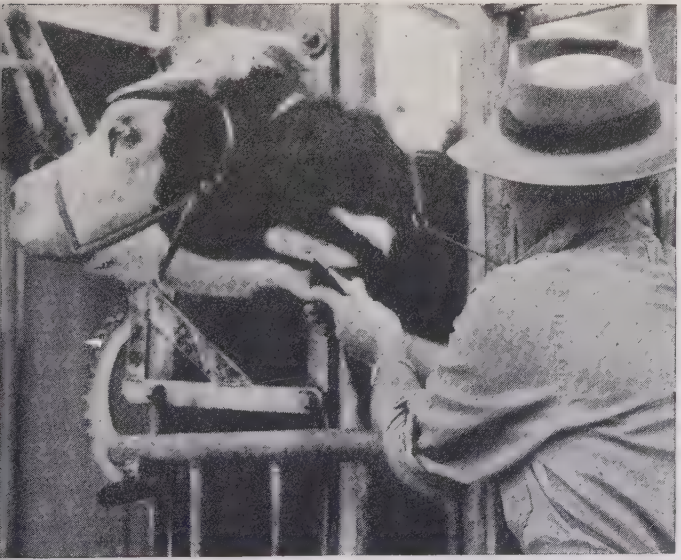


Plate 3

Taking Blood from a Bleeder. Before the trocar and cannula are inserted, the hair is clipped and the skin cleaned with methylated spirit.

Plate 4

Drenches Can Be Administered with Either a Bottle or a Gun. In drenching, tilt the head slightly upwards, but not more than 45 deg.

In cases which do not respond to injections, it is the author's opinion that pumping of air into the udder to stop further milk secretion is justified and often effective. Scrupulous cleanliness in the operation is essential to avoid mastitis. But before this procedure is adopted, such cases should receive veterinary attention if at all possible. Refractory cases of milk fever may benefit from drenching with two pints of glycerol daily as the condition may be complicated by acetonaemia.

Pregnant ewes often develop pregnancy toxaemia or a twin lamb disease in advanced pregnancy and require treatment with glycerol. Daily dosing with 4 oz. of glycerol has been found effective in some cases, especially those due to a sudden change of conditions.

Grass Tetany

In some dairying areas where recently calved cows are confined to one crop such as oats or barley, tetanic spasms, thought to be due to a deficiency of magnesium, may develop.

Drenching with 8 oz. of Epsom salts (magnesium sulphate) may correct this condition. However, a veterinary surgeon will also inject a magnesium solution into the blood stream, and should be consulted.

Tick Fever

The common form of tick fever or redwater can be treated successfully by the early injection of tick fever drugs, all of which are specific and reliable. The dose rate is calculated on body weight.

Tick fever causes a rise in temperature to between 105 and 109 deg. F., red urine and depression. These symptoms would justify treatment for tick fever in tick infested areas. The temperature should drop 3 to 4 deg. within six hours of treatment, otherwise a second injection is necessary. A thermometer is absolutely necessary to gauge the response to treatment (Plate 7).

When tick fever drugs fail, the services of a veterinarian should be obtained to ascertain whether the redwater symptom is due to another disease, leptospirosis, which is a widespread infection, particularly in dairy cattle.

Redwater appearing in an animal under nine months is usually due to leptospirosis. However, in yearling and adult cattle the two diseases can be difficult to diagnose with certainty unless a response is obtained with tick fever antidotes or a smear is positive for tick fever. Blood and urine can be examined for the presence of leptospirosis.

Plate 5

A Subcutaneous Injection in the Loose Skin Behind the Shoulder. Before the needle is removed the injection should be massaged to prevent it running out through the puncture.

Injuries and Stake Wounds

Stake wounds and injuries due to bumps and falls are common on farms and stations.

When haemorrhage is severe, plugging the wound with cotton wool and bandaging with sheeting will save the animal until skilled help can be obtained. Unless the stake can be seen or felt, it is unwise to probe around looking for pieces which may have become embedded in tissue.

Stake wounds in horses respond immediately to penicillin treatment which prevents a bacterial nvasion of the surrounding tissue. A course of treatment giving 3-million units daily for three days has been found very effective. For best results, treatment should begin within 24 hours of the injury. However, if there are any fragments of dead bone or foreign material such as splinters left in the wound, it will usually break out again. These cases are best left to a veterinary surgeon.

Punctured wounds may be dangerous as they provide an ideal medium for the development of tetanus. Unless stock have been immunised, tetanus anti-serum should be used. Horses and cattle require 1,000 units while 500 units are sufficient for smaller animals and young stock.

Plate 6

A Flutter Valve Outfit is Used for Subcutaneous Injections of Large Volumes of Solutions.

Plate 7

Temperature Recording. A clinical thermometer is introduced into the rectum to about two-thirds of its length and allowed to remain in contact with the rectal wall for 2 min. The normal rectal temperature of cattle is 101 to 102 deg.

Instruments

Hypodermic Syringe.—Plastic syringes are very suitable for inoculation with drugs. They are unbreakable and the rubber plunger rings can be replaced. Two sizes are mainly used, 20 cc. and 10 cc.

Syringes used for blackleg vaccination are also satisfactory for other treatments such as the use of penicillin or anti-tetanus serum. The best needles for general cattle work are 16 gauge S.W.G.

Thermometer.—A clinical thermometer can be obtained at a small cost from chemists. Unless the temperature of a sick animal is known, specific treatment is impossible. The normal rectal temperature of cattle is about 101 to 102 deg. F. A rise of 2 deg. could indicate a possible infection. Factors such as heat, age and exertion must be considered.

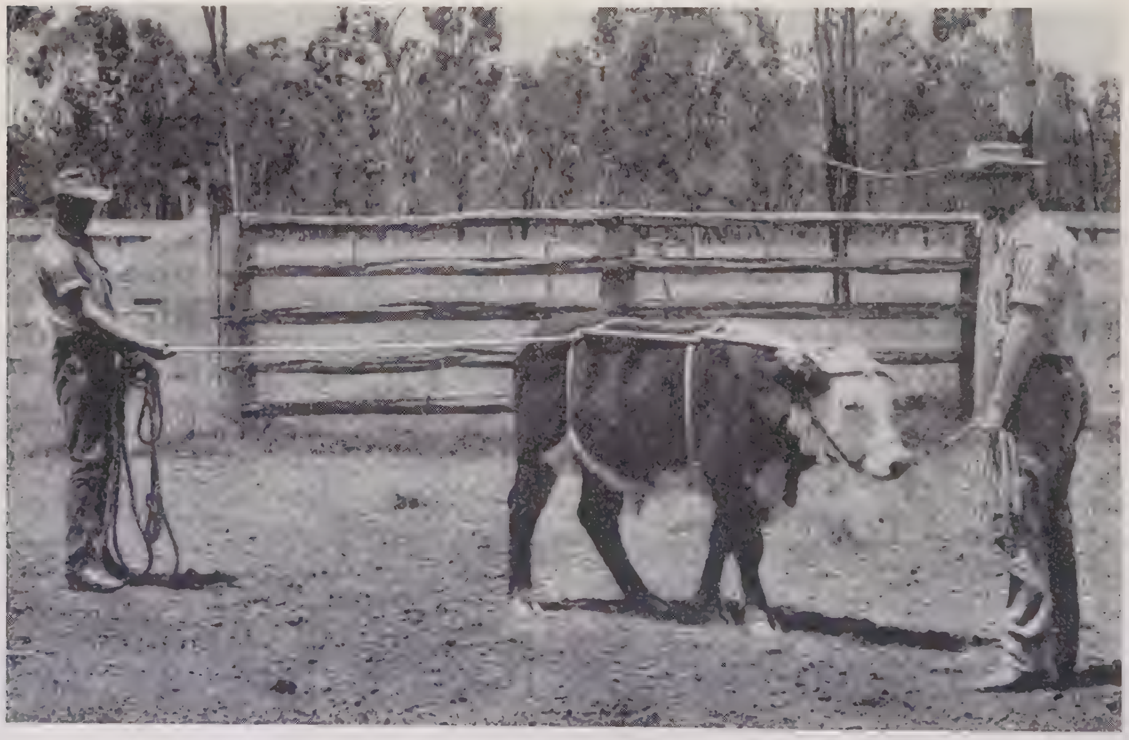


Plate 8

This is a Simple Method of Casting Cattle for Minor Surgery. With large beasts it is advisable to hitch the headrope round a post.

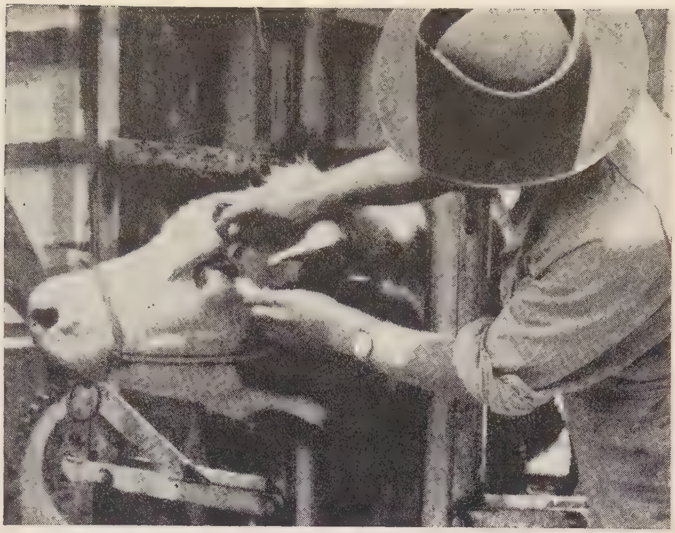


Plate 9

So Long as the Animal is Held Securely, Blight Remedies Can Be Applied Effectively by Means of an Insufflator. In advanced cases, daily treatment is necessary.

—Photographs by "The Morning Bulletin," Rockhampton.

Stake Forceps.—On grazing properties stake forceps are useful to remove protruding stakes from horses.

Trocar and Cannula.—Where lucerne and clover grazing is practised this instrument is essential. Spraying lucerne and irrigated pastures with tallow has reduced the risk of bloat considerably.

Gravity Feed Apparatus.—Where large volumes of solutions such as sulphadimadine and calcium borogluconate are to be given as an injection a rubber tubing outfit known as a flutter valve can be attached to the neck of a bottle, saving a tedious job with a syringe.

Using the Instruments.—In using a syringe to give an intravenous injection (Plate 2), the jugular vein is distended by means of a tourniquet. A hypodermic needle is inserted into the vein. When the blood flows freely from the needle, the tourniquet is released and the syringe is attached to the needle. Drugs can be given by this method, but they should be administered slowly.

A trocar and cannula is used to take blood from a bleeder (Plate 3). First, the jugular vein is distended by applying a tourniquet, and the hair over the vein is clipped. The skin is cleaned with methylated spirit and a small incision is made to allow free entry of the trocar and cannula. When the point of the trocar pierces the jugular vein a sudden loss of tension is felt. Then the cannula can be positioned so that the cannula lies within the vein and pointing in the direction of the beasts's head. When the trocar is removed, the blood should flow from the cannula in a strong stream so long as the jugular vein is held under pressure by the tourniquet.

When sufficient blood has been collected, the tourniquet is released and the trocar reinserted into the cannula. The instrument is then withdrawn. The punctured area should be pinched firmly until bleeding has ceased, otherwise haematoma will form and interfere with later bleedings.

Drenches can be administered with a bottle or a gun (Plate 4). The beast's head should be held under your arm and raised sufficiently to prevent the animal from rejecting the drench. A bail is best for restraining the animal, but the operation can be done in a crush. The animal's head should not be raised more than 45 deg. from its normal position or the drench may pass into the windpipe and cause damage to the lungs.

A subcutaneous injection is given in an area of loose skin either on the side of the neck or behind the shoulder. (Plate 5.) The hair is clipped and the skin cleaned with methylated spirit. A fold of skin is held between the forefingers of one hand while the needle is pushed forcibly against the skin until it penetrates and its stem is between the skin and the underlying muscles. The syringe is then attached and the injection made. Before removing the needle, the injection should be massaged away from the needle to prevent its return through the skin puncture when the needle is removed.

If large volumes of solutions are to be administered by subcutaneous injection, a flutter valve outfit is used. (Plate 6.)

For minor surgery, cattle can be cast with little effort by applying two half-hitches, just behind the shoulder and just in front of the hip. (Plate 8.) When tension is applied to the rope the animal collapses. With large beasts, it is advisable to hitch the headrope round a post.

◆

Red Clover

Interest in red clover and its use in irrigated pastures has prompted many inquiries regarding this plant.

Answer: Red clover or "cow grass" is a native of Europe and is extensively grown in temperate countries for pasture and hay purposes. In Queensland red clover is an important legume for inclusion in irrigated pasture mixtures where it provides grazing well into the summer. It may last for four to five years in southern States but the climatic conditions here tend to cause it to decline after two to three years.

The plant is upright in growth and has hairy leaves and stems. It has fairly large flower heads which are globular shaped and reddish-purple in colour. As it does not favour hot or dry conditions it is not satisfactory on the tropical coast or the drier parts of the State. In southern Queensland it does well where irrigated. In these circumstances it begins to produce abundant growth about August and in mild summers it will continue to produce well for a long period frequently throughout the summer.

Red clover favours clay to clay loam soils which are well drained and preferably mildly alkaline to slightly acid in reaction. Medium to strongly acid soils are not suited to red clover growing.

This plant is usually sown in pasture mixtures, frequently in association with white clover. The planting rate varies but is usually about ½ to 1 lb. to the acre in a mixture with suitable grasses and other legumes. Planting should be done during autumn.

The palatability of red clover may vary from time to time due to the hairy coating on the plant but generally stock take the plant readily. As with most clovers, bloating may be troublesome during periods of lush growth.

In recent years red clover has shown a great susceptibility to rugose leaf curl and consequently it is now considered unwise to include this legume in pasture mixtures. Once the red clover has become infected with rugose leaf curl it could act as a source of infection for other legumes which are susceptible to the disease.

The types of red clover usually grown in Queensland are New Zealand cow grass and Montgomery red.

stock and station

Regularity of Breeding.—To the commercial cattleman who has a breeding property, the breeding cow is the basic animal. Her job is to produce the saleable product—the calf.

When you have the chance to cull some cows, number one yardstick should be regularity of breeding. Aim at developing a herd of cows which produce a calf every year.

That's a very high standard, but you could approach it this way. At the end of the main calving season, or when you do the first round after the wet season, note all the dry cows. Identify them in some way. You can use coloured or metal tags, for instance. Or you may be able to draft them off into a separate group.

Then in six months' time—say about September—look them over again. Cull those which show no sign of producing a calf. They should be fat and find a ready market.

Your culling for type should have been done before the heifer was allowed into the breeding herd. Once an animal is taken into the breeding herd her value depends largely on the number of calves she will produce in a given time. Many cows produce a calf a year—you can have a greater proportion of them if you make it your number one culling point.

—*W. F. MAWSON,*
Senior Adviser in Cattle Husbandry.

Litter Recording.—Litter recording will supply the answers to questions about the productivity of your pigs.

Litter recording not only points out the productive from the unproductive sows; it also shows up faults in feeding, housing, and management practices, if the records are kept accurately and used intelligently.

Recording consists of weighing all litters at birth, 3 and 8 weeks. Records are kept for a year and then evaluated. Each sow is awarded points according to age, number and weight of pigs weaned. Sows which rear a litter that scores more than a standard number of points will be given a "star" rating. Similarly the boar is given star rating if he sires enough star litters.

To find out how good your sows are, see your local Pig Branch Officer, and ask him to submit your herd to litter recording.

—*T. ABELL, Senior Adviser, Pig Branch.*

Care Pays in Weaning Lambs.—The earning capacity of a lamb is often marred in the few months when it first has to fend for itself. Those given good care and feed have the best opportunity to develop into heavy wool producers.

The best paddocks should be reserved for weaners. These paddocks should not only have good feed and water, but also shade, shelter and secure fences.

The best weaning age is five months, because by then most of the ewes have gone dry although they are still conducting their lambs to feed and water. If they have been without green feed for some months and if the season is likely to remain dry, it is a good idea to drench lambs at weaning with 500,000 international units of vitamin A emulsion. You are unlikely to observe any change in their condition, but it has been shown that weaners are better able to pull through a dry spell if given this drench.

The time taken to crutch and wig the young sheep is time well spent. Wigging is especially useful if the paddock carries burr or if the sheep are likely to become seeded around the head.

Sheep going into a new paddock should always be put on the water, and if thirsty at the time so much the better. This should be done in the daylight and for preference just before dusk. The sheep should also be held on the water for a short time so they will be better able to remember its location. A few adult, dry sheep run with the weaners will help to conduct the young stock around. After the weaners have been put into their new paddock, don't forget them. For a week or so, ride the fences carefully every day, driving the stragglers out of corners and back to the water points where they can join up with the main flock.

Mules Operation.—Any way you look at it, having the Mules operation performed on your sheep gives you security. Today, it should be the starting point of all your blowfly control measures.

In the days before the Mules operation, you could never be sure a bad smash wasn't just around the corner as the result of a sudden fly wave. Now, with a Mules-treated flock, even the worst fly wave is unlikely to cause very heavy losses.

Then, when crutchers aren't readily available, you have a margin of safety. Mulesed sheep are much less prone to crutch strike than untreated sheep, so you may be able to wait until a team of crutchers is free. On the other hand, you may have to jet your flock because a mid-season crutching can't be arranged. If this happens, you'll find that jetting mulesed sheep gives better protection.

You can reckon the cost of breech strike in terms of dead sheep, lower wool cuts, lower wool prices and smaller lambings. One strike will reduce a sheep's wool cut by 2½ per cent. And it's well to remember that wool production continues to decrease as the number and size of the strikes increase.

Tenderness of the fleece, which reduces its value, is associated with fly strike. A flock that has had small or medium strikes can be expected to cut about 15 per cent. of tender fleeces. But the occurrence of large strikes, measuring 5 in. or more across, can lift the number of tender fleeces to as high as 44 per cent.

Blowfly strike also reduces the fertility of ewes. Of ewes that have been struck, fertility is usually in the region of 15 per cent. below that of ewes free from strike.

On top of all these advantages, mulesing reduces your other blowfly control measures to a minimum. This leaves more time and labour free for property development.

—*M. N. JACKSON,*
Senior Sheep and Wool Adviser.

Endrin Sprays Poison Stock.—Endrin is highly poisonous to stock and should on no account be used to spray cattle for ticks. Don't let its high efficiency in dealing with certain vegetable pests mislead you into believing it can be used on stock.

Several Brisbane district farmers have reported deaths and sickness in cattle after spraying with endrin. These farmers had been controlling vegetable pests with endrin and, impressed by its effectiveness, had tried it against cattle ticks.

Endrin is also used extensively against tobacco pests, and in the past, losses from endrin poisoning in cattle and poultry have occurred in the Mareeba district. As tobacco growing is now extending into new areas, new tobacco growers should avoid the mistake of using endrin on house cows or other stock.

Endrin is a nerve poison. Symptoms of poisoning include excessive excitability, especially when stock are handled. Affected stock move hesitantly as though their vision is impaired, their ears flap more than usual and blinking may occur. Some muscle tremor is usually present. In severe cases convulsions may occur with the animal falling on its side and kicking aimlessly.

If you suspect endrin poisoning, seek veterinary assistance immediately. At all costs, avoid disturbing the stock as this will bring on or intensify the symptoms. Put affected stock in a paddock with shade and water. It may be desirable to stop milking them.

Calves are even more susceptible to endrin poisoning than adult stock. Affected calves are best housed in a darkened barn or shed to lessen the degree of stimulation.

It should be noted that the organic phosphate spray, parathion, also should be used only on plants.

—*S. G. KNOTT,*
Divisional Veterinary Officer.

Nasal Bot of Sheep

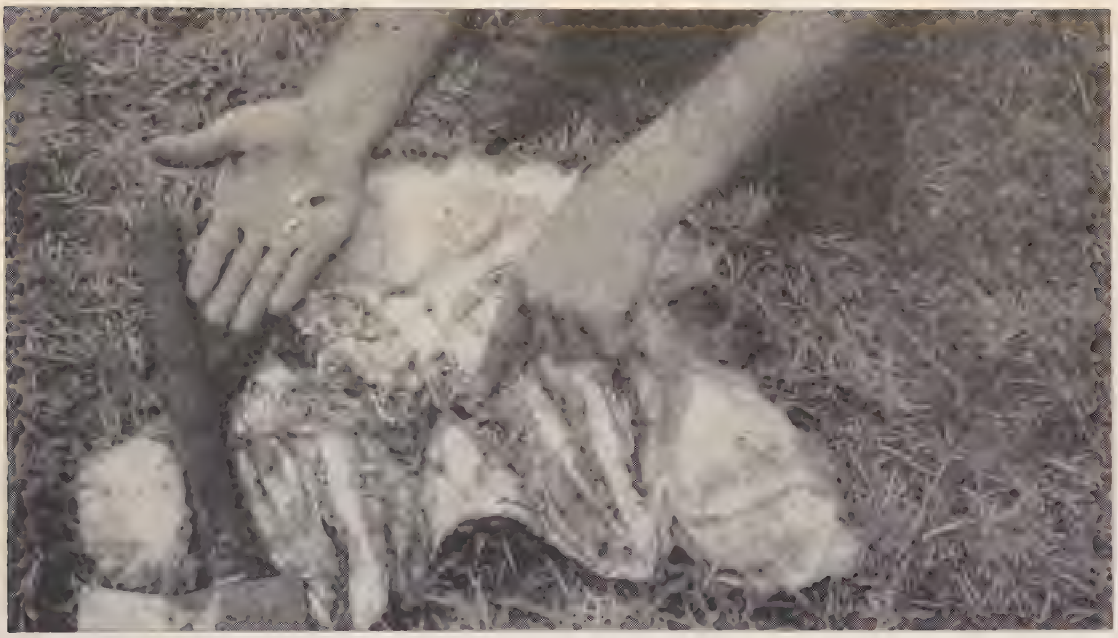


Plate 1

A Freshly Split Sheep's Skull. The demonstrator is pointing to the nasal sinuses of the skull into which the larvae crawl and mature, causing the typical "snotty nose" which is the main symptom of this disorder.

Plate 2

Nasal Bot Larvae, Compared in Size with a Match Box and Hat. An article on control of sheep nasal bot with lindane appeared in the August 1959 issue of the *Queensland Agricultural Journal.*

Tuberculosis-Free Cattle Herds

(As at 1st July, 1960)

Aberdeen Angus

Crothers, G. H. & H. J., "Moorenbah", Dirranbandi
Elliott, A. G., "Ooraine", Dirranbandi
Mayne, W. H. C., "Gibraltar", Texas

A.I.S.

Cox, T. L. & L. M. J., Seafield Farm, Wallumbilla
Crookey, J., Arolla A.I.S. Stud, Fairview, Allora
Davis, W. D., "Wamba", Chinchilla
Dennis, L. R., Diamondvale A.I.S. Stud, Mundubbera
Edwards Bros., "Spring Valley" A.I.S. Stud, Kingaroy
Evans, E. G., Lauraven A.I.S. Stud, Maleny
Green, D. B., Deloraine A.I.S. Stud, Fairdale
Heading, C. A., "Wilga Plains", Maleny
Henry, Mrs. K., Greenmount
Henschell, W., "Yarranvale", Yarranlea
H. M. State Farm, Numinbah
Littleton, H. V., "Wongalea", Hillview, Crow's Nest
Marquardt, A. C. & C. R., "Cedar Valley", Wondai
McShane, A. H., Handford Road, Zillmere
Mears, G. S. & E., "Morden", M. S. 755 Toogoolawah
Moore, S. R., "Sunnyside", West Wooroolin
Neale, D. G., "Groveley", Greenmount
O'Sullivan, Con., "Navillus", Greenmount
Power, M. F., "Barfield", Kapaldo
Messrs. Mitchell and Mulcahy, Rosenthal
Queensland Agricultural High School & College, Lawes
Radel, R. R. & Sons, "Happy Valley", Coalstoun Lakes
Roche, C. K., Freestone, Warwick
Sanderson, W. H., "Sunlit Farm," Mulgildie
Schloss, C. J., "Shady Glen", Rocky Ck., Yarraman
Scott, M. E. & E., "Wattlebrae" A.I.S. Stud, Kingaroy
Scott, W. & A. G., "Walena" A.I.S. Stud, Blackbutt
Shelton, R. A. & N. K., "Vuegon" A.I.S. Stud, Hivesville, Murgon
Estate Sokoll, A. H., "Sunny Crest", Wondai
Sperling, G., "Kooravale", Kooralgin, Cooyar
Sullivan Bros., "Valera", Pittsworth
Sullivan, D., "Bantry", Pittsworth
Sullivan, F. B., "Fermanagh", Pittsworth
Thompson, W. H., "Alfavale", Nanango
Webster, A. H., "Millievale", Sabine, via Oakey
Wieland, A. W., "Milhaven", A.I.S. Stud, Milford, via Boonah

Ayrshire

Dudgeon, C. E. R., Marionville Ayrshire Stud, Landsborough
Dunn, T. F., "Alanbank", Gleneagle
Goddard, B., Inverell, Mt. Tyson, via Oakey
Holmes, L., "Benbecula", Yarranlea
Mathie, E. & Son, "Ainslie", Maleny
Scott, J. N., "Auchen Eden", Camp Mountain
Zerner, G. F. H., "Pineville", Pie Creek, Box 5, Post Office, Gympie

Friesian

Behrendorff, E. C., Inavale Friesian Stud, M.S. 786, Boonah
Macdonald, S. E. G., "Freshfields", Marburg
Naumann, C. H., "Yarrabine", Yarraman
Pender, D. J., Lytton Road, Lindum
Stumer, A. O., Brigalow, Boonah

Guernsey

Doss, W. H., Degilbo, via Biggenden
Fletcher, A. B., "Cossart Vale", Boonah
Holmes, C. D. (owner Holmes L. L.), "Springview", Yarraman
Johnson, G. L., "Old Cannindah", Monto
Miller, G., "Armagh Guernsey Stud", Armagh, M.S. 428, Grantham
Ruge, A. & Sons, "Woowoonga", via Biggenden
Scott, C., "Coralgrae", Din Din Rd., Nanango
Swendson, A. C., Coolabunia, Box 26, Kingaroy
Wissemann, R. J., "Robnea", Headington Hill, Clifton

Jersey

Beckingham, C., Trout's Rd., Everton Park
Birt, W. C. M., Pine Hill Jersey Stud, Gundiah
Borchert, Mrs. I. L. M., "Willowbank" Jersey Stud, Kingaroy
Burrows, R. N., Box 23, Wondai
Bygrave, P. J. L., The Craigan Farm, Aspley
Carpenter, J. W., Flagstone Ck., Helidon
Conochie, W. S. & Sons, "Brookland", Sherwood Rd., Sherwood
Crawford, R. J., Inverlaw, Kingaroy
Farm Home For Boys, Westbrook
Fowler, P. & Sons, "Northlea", Coalstoun Lakes
Harley, G., "Hopewell", M.S. 189, Kingaroy
H.M. State Farm, Palen Creek
Hutton, D. R., "Bellgrath", Cunningham, via Warwick
Johnson, H. G., Windsor Jersey Stud, Beaudesert
Lau, J. F., "Rosallen", Goombungee, Toowoomba
Matthews, E. A., "Yarradale", Yarraman
McCarthy, J. S., "Glen Erin", Greenmount, Toowoomba
Meier, L. E., "Ardath Stud", Boonah
Noone, A. M. & L. J., "Winbirra", Mt. Esk Pocket
Porter, F., Conondale
Q.A.H.S. & College, Lawes
Ralph, G. H., "Ryecome", Ravensbourne
Scott, Est. J. A., "Kiaora", Manumbar Rd., Nanango
Semgreen, A. L., "Tecoma", Coolabunia
Seymour, B. T., "Upwell" Jersey Stud, Mulgildie
Smith, J. A. & E. E., "Heatherlea" Jersey Stud, Chinchilla
Tatnell, W. T., Cedar Pocket, via Gympie
Toowoomba Mental Hospital, Willowburn
Verrall, F. W., "Coleburn", Walloon
Weldon Brothers, "Gleneden" Jersey Stud, Upper Yarraman

Poll Hereford

Anderson, J. H. & Sons, "Inverary", Yandilla
Hill, W. W., Mathalla
Hutton, D. R. & M. E., "Bellgrath", Cunningham, via Warwick
Maller, W., "Bore View", Pickanjinnie
Maller, W., "Bore View", Gowrie Junction
McCamley, E. W. G., "Eulogie Park", Dululu
Wilson & McDouall, Calliope Station, Calliope

Poll Shorthorn

Leonard, W. & Sons, Welltown, Goondiwindi
Yamburgan Pastoral Company, Noondoo

Aiming At Efficient Pollination In Apples

By M. A. HANNIGAN,
Senior Adviser in Horticulture.

Growers can take precautions towards obtaining efficient pollination in apples, without which a full crop cannot be achieved.

The aim of every orchardist is to produce vigorous, healthy, well-grown trees which bear the maximum crop of fruit each year.

Many apple growers have good type trees but fail to get regular crops from year to year. Several factors may cause such irregularities in cropping. If yields are still low after allowance is made for the adverse effects on fruit set of spring frosts, cold winds, and wet weather at blossoming, lack of adequate pollination could be involved.

Pollination

The flower of the apple is complete with pistil, stamens, petals and sepals. The pistil has a swollen base and a tube-like style with a swollen stigma at the top. The stamens carry anthers at the tips which open at maturity and liberate pollen. When the discharged pollen reaches the surface of the receptive stigma, it germinates and forms pollen tubes within the style through which the male nuclei pass to the ovary. Here, fertilization takes place and development of the fruit begins.

Self-Sterility

Many varieties of apple either fail to set a crop or set only a partial crop when the flowers receive pollen only from flowers of the same tree or other trees of the same variety. Block plantings of such varieties can be expected to produce only light crops of fruit and are therefore of little commercial value. The flowers are said to be self-sterile.

The causes of self-sterility in apples are many and varied. Sometimes pollen tube elongation is too slow to permit fertilization of the ovary. Sometimes, inherent sterility factors are involved in the failure of the reproductive mechanism. In some varieties, such as Gravenstein, for example, the pollen is actually non-viable and incapable of pollinating flowers of the same or any other variety of apple.

Fortunately, from the point of view of the apple grower, cross pollination between varieties is consistently effective and this fact is exploited in commercial orchard practice to ensure normal cropping from year to year. This pre-supposes inter-planting of two or more varieties when the orchard is established.

As varieties differ in their times of flowering and the period from bud burst to petal fall in a single variety is only a matter of days, the varieties selected for inter-planting must have similar blosoming times.

Inter-planting

The main varieties of apple grown at Stanthorpe, in their order of importance, are Granny Smith, Delicious, Jonathan, Gravenstein, Winesap and McIntosh Red. Most of these varieties blossom at or about the same time.

With the exception of Gravenstein, any two of the foregoing varieties may be planted together. As mentioned previously, Gravenstein pollen is non-viable and where this variety is grown commercially, a three-variety planting is

Plate 1

Winter in the Apple Orchard. A season for reflection. If crops are below expectation, pollination may be faulty. Top-working some trees with a pollinator variety may be necessary.

necessary, the usual combination being Gravenstein, Jonathan and Granny Smith. The Gravenstein blossom is pollinated by both Jonathan and Granny Smith, while these two varieties pollinate each other.

Pollen must be carried from one variety of apple to another if cross-pollination is to be effective. The transfer of pollen from tree to tree is largely carried out by bees. When working at high pressure during full blossom, bees

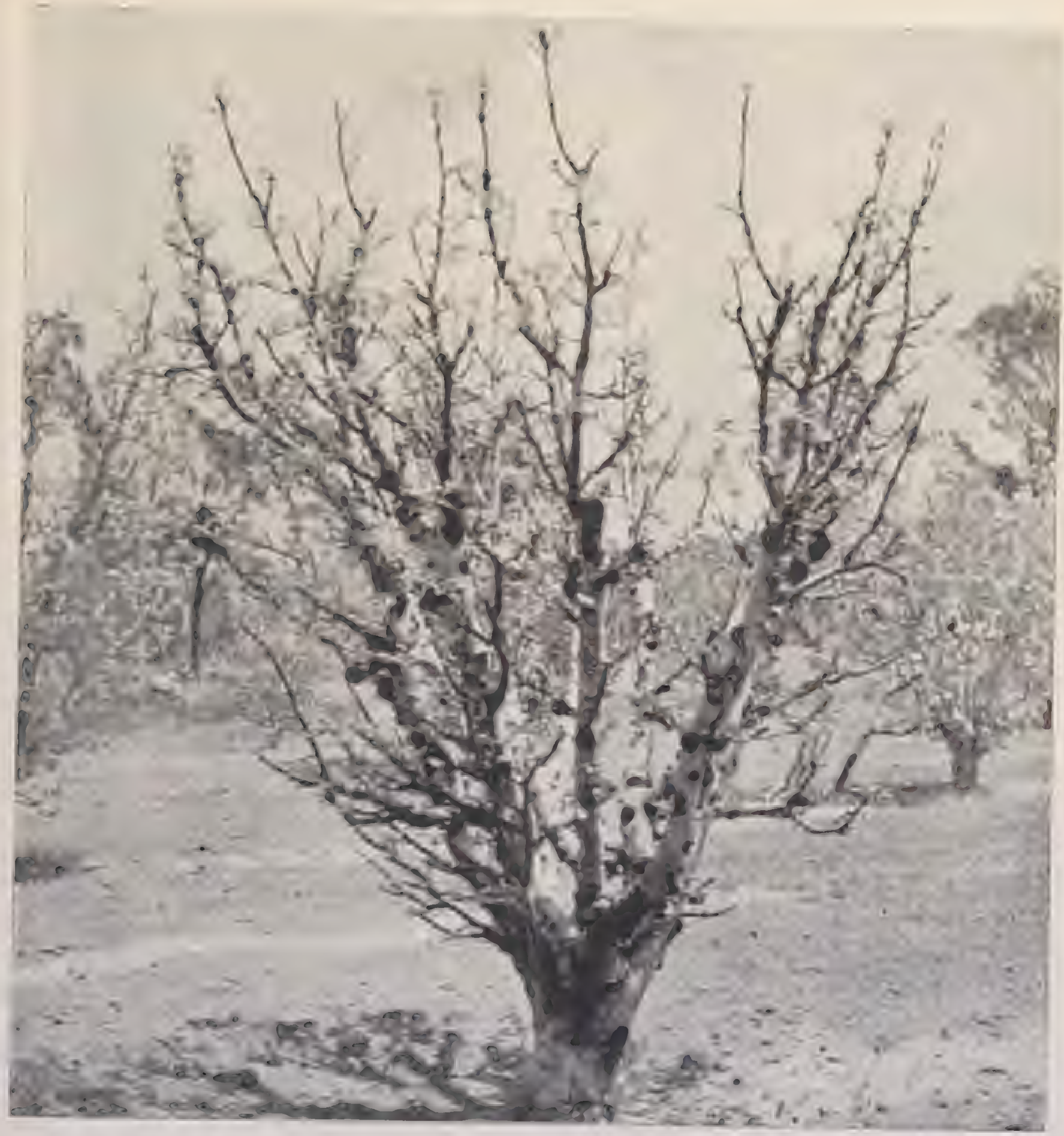


Plate 2

Top-Worked Tree at Bud Burst. Top-working selected trees with a second variety is a recognised method of improving pollination in the orchard.

forage over only a relatively short distance. It follows, therefore, that the inter-planted varieties of apple should be reasonably close together. In commercial orchards, this is achieved by establishing two varieties (A and B) so that two rows of variety A adjoin two rows of variety B. The maximum permissible distance between pollinator trees should not exceed three rows.

Wet, cold or cloudy weather at blossoming will slow down the activity of bees. In order to ensure a full set of fruit under such conditions, at least one hive of bees is needed for each acre of trees in the orchard. Care must, of course, be taken to avoid using the more lethal insecticidal sprays when the trees are in full bloom; otherwise considerable damage may be done to the hives.

If, for any reason, the grower wishes to plant only the minimum number of trees needed to pollinate his main commercial variety, every third tree in every third row should be a pollinator. With this arrangement, one tree in nine is a pollinator surrounded by eight trees of the desired commercial variety.

Where the number of pollinator trees in an established orchard is insufficient to ensure a full set of fruit, the deficiency can be made good by top working or refurnishing the required number of trees with scionwood of the pollinator variety. This procedure is better than grafting over single limbs on several trees with scionwood of the desired type.

Seasonal Factors

Dry weather, excessive rain and late spring frosts influence blossoming times and their effect is greater in some varieties than in others.

In 1958–59, for example, blossoming was erratic in the three main commercial varieties—Granny Smith, Delicious and Jonathan. Granny Smith was in full bloom before the Delicious flowers had opened. Fortunately, Jonathan trees blossomed shortly after the Granny Smiths and, in three-variety plantings, pollinated both Granny Smith and Delicious. Inter-plantings of three varieties in an apple orchard is probably the best available precaution against poor setting due to variations in blossoming times due to climatic factors. In such plantings, pollen is available for the longest possible period.

Effective pollination is essential for a full crop of apples. It is no substitute for deficiencies in plant foods or soil moisture at critical period of growth in spring. Without it, however, the grower cannot hope to reap the full benefit to be derived from efficient soil management in the orchard.

Pre-Germinate Early Cucumber Seed

The market pays a premium for early cucumbers, melons and pumpkins. If you want to place your crops on this market, it is necessary to pre-germinate the seed before planting.

The market for early cucumbers is so profitable that it is worthwhile making special efforts to exploit it. On light-textured soils with a warm aspect, shallow planting and a heavy sowing rate may solve the problem and get a good stand from plantings made in June and July. But in most vegetable growing districts on the coast, better results can be obtained by pre-germinating the seed.

One of the easiest ways to pre-germinate seed is to spread it evenly between wet bags in a warm room. The bags must be clean, or moulds may develop and smother the seed. If old bags are used, they should be sterilized by boiling before use. The seed may be soaked for a few hours before it is put between the bags, but this is not necessary if the bags are kept moist.

Temperatures in rooms used for pre-germinating seed should be held at 70 deg. F. or higher. This temperature corresponds to that of a farm kitchen with a coke or wood stove. On farms with papaw ripening rooms or chicken brooders in which the temperature rarely drops below 80 deg., bags are unnecessary and the seed may be pre-germinated by placing it in an enamel or plastic basin, covering it with water for a few hours, draining off the surface water and holding the seed until germination begins.

Pre-germinated seed is ready for machine planting at the first sign of a break in the seed coat. If it is to be planted by hand it is better to wait until the root tips emerge from the seed. Planting should never be delayed beyond this stage as seeds with protruding roots are difficult to handle without damage. If the roots are damaged, any advantage from pre-germination is lost. Pre-germinated seed should be planted in moist soil. If the soil is not moist, the land should be irrigated immediately after planting.

—C. N. MORGAN,
Senior Adviser in Horticulture.

orchard and garden

Winter Irrigation of Papaws.—Growers know well just how sensitive papaw trees are to soil moisture. Even on a well-drained soil there is a certain amount of seasonal hazard, and this applies particularly to irrigated plantations.

Growth in spring and summer is vigorous. The soil needs plenty of water to balance big moisture losses from direct evaporation and foliage transpiration. Liberal irrigation is then required to maintain the sequence of growth, flowering and fruiting.

The position is different in winter. Growth is slow, evaporation and transpiration rates fall, water requirements decline considerably and over-generous irrigations can easily cause serious troubles in the way of root rots, particularly among young trees.

—D. DOWDLES, Adviser in Horticulture.

Fertilizer Burn in Bean Crops.—In beans, slipshod applications of the pre-planting fertilizer could cost you the best part of your crop. Unless the fertilizer is placed correctly, it may cause root damage and an irregular stand of plants.

The 5:14:2 pre-planting fertilizer should be placed in a band 4 to 6 in. wide. The depth should be about 2 in. below the level at which the seed will be planted.

Some farmers open up planting furrows and apply the fertilizer in the furrow. This is scuffled into the soil and the seed is planted by hand. This procedure is satisfactory provided the fertilizer is placed in the bottom of the furrow and sufficient soil is brought from the sides to cover it to the required depth. Seed planted in soil containing excessive amounts of raw fertilizer may fail to germinate, or give a poor stand.

—K. KING, Senior Adviser in Horticulture.

Condemned Fruit.—In these days of high costs of production, fruit and vegetable growers must be careful to market only good quality produce. The condemnation of fruit and vegetables is always rather a nasty pill for the grower to take. However, there are times when even the best of growers has a case or two of fruit or a bag of vegetables withheld from sale for one reason or another. The produce may have been damaged during transit, fruit breakdown could have taken place or, worse still, the grower's produce could have arrived at the market during a glut period. In this event a sale may not have been possible before the produce had become unsound and not fit for sale. Within 24 hours of the action being taken, the Market Inspector must issue a certificate of condemnation for all of the produce condemned at the Brisbane markets and give it to the agent who has control of the produce.

This direction is carried out strictly in accordance with the Queensland Fruit and Vegetables Act.

Once the departmental certificate has been issued to the agent it is his responsibility to ensure that it is forwarded to the grower concerned. If a grower has been advised that his produce was condemned, he should ask his agent for the certificate. This is the grower's right.

—A. J. CROCKER, Senior Market Inspector.

Interception Drains.—Surface water must be diverted away from cultivated crops. Interception drains are therefore indispensable on fruit and vegetable farms in southern Queensland where commercial crops are grown on sloping ground sometimes with very steep grades.

Failure to install these drains and to keep them in good working order only increases soil erosion problems during heavy rains and aggravates water-logging afterwards. They are especially important in areas where crops are planted in spring and autumn on shallow soils which erode easily and drain slowly.

The interception drain is simply a deep channel across the slope on the upper side of the cultivated area. Its purpose is to collect surface run-off and seepage water from farther up the slope and drain it away to a gully or some other natural waterway. The capacity of the drain varies with the extent of the land above it but the usual dimensions are 9 in. wide and 18 in. or more deep. In shallow soils, the drain should penetrate some inches into the subsoil clay. Where necessary, increased capacity is provided by widening the drain rather than by increasing its depth.

The drain must have a fall of 2 ft. or more in each 100 ft. run to lessen the risk of blockages caused by the sides caving in. If no gully outlet is available, the run-off water can be taken to a grassed paddock where the flow during heavy rain is unlikely to do any damage.

Construction of the interception drain is part of the work involved in preparing land for cropping and is normally carried out before the wet season. In newly constructed drains, maintenance patrols are necessary during and after each fall of rain. Any spoil or debris which might lead to blockages in the flow of water should be cleaned out periodically until the drains have become stabilised. Thereafter patrols after each wet season should be adequate.

Construction and maintenance of interception drains is a routine job which saves both your soil and your crops in a difficult season.

—R. L. PREST,
Senior Adviser in Horticulture.

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RENEWAL
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Watch This When Welding

There is a common opinion that welding equipment with alternating current voltages of up to 90 volts may be used without risk of electric shock. This is entirely incorrect. Fatalities among welding operators have occurred through shocks received from circuits supplied with voltages of 70 to 80 volts alternating current. Any alternating current voltage over about 32 volts must be considered potentially dangerous, but it is with A.C. welding, which invariably involves the use of voltages of 70 to 80 volts, alternating current, that we are particularly concerned in this instance.

All welding operators should have full knowledge of the elementary precautions to be taken to avoid electric shocks. The following safeguards are easy to apply, and should be practised during the course of their work by those engaged in manual metallic arc welding.

(a) Secondary Connections

Whenever practicable, the power should be cut off from the welding terminals before connecting the welding leads to the terminals.

The welding leads of transformer-type machines must be connected as indicated on the machine terminals.

Connections of and in the welding leads may be made by the operator, who should ensure that all electrical connections are clean at the contact areas, and that they are properly tightened and insulated.

(b) Precautions When Welding

All parts of the welding circuit, including the return path, should be considered electrically alive. Consequently the operator must ensure that no part of his body is placed in such a position as to complete a path through it for the passage of electric current.

When working in positions which require him to stand on or rest against the work to be welded, or against any metal in contact with the work, the operator should exercise care not to touch the exposed portion of the electrode or the electrode-holder with any other part of his body, thus incurring the risk of the passage of an electric current through his body.

Under no-load conditions there should be no potential difference between the electrode holders of welders working together. Welders with machines connected to separate phases should not work in close proximity to one another.

(c) Welding in Confined Spaces

Where the operator is required to weld in a confined space such as a boiler drum, air receiver, tank, or in similar positions, the following conditions should be observed:

(i) An all-insulated electrode holder should be used.

(ii) Adequate ventilation should be provided.

(iii) An assistant should be appointed to keep the operator under constant observation.

(iv) Suitable means should be provided, adjacent to the work, to enable the assistant to cut off the power quickly in case of necessity.

(v) Provision should be made for the expeditious withdrawal of the operator in case of shock or other injury, and for the application of suitable treatment.

When a welding operator is called upon to work in a confined space the power should be cut off until he is in position for welding, and also when for any reason he is required to leave the job.

It is desirable that apparatus be provided to reduce the no-load (open circuit) voltage to a value not greater than 32 volts. If such apparatus is used the conditions specified in (iii) and (iv) may be waived.

(d) Insulation

The flux of an electrode holder should not be assumed to be effective insulation. Consequently the changing of an electrode into the holder, or the handling of an electrode once it is in contact with the holder (whether the holder is of the all-insulated type or not) should be done with an insulating glove or other protective device. Alternatively, the power should be cut off during these operations.

Note.—A dry leather glove usually has some insulating properties, and may be considered as an insulating medium, whereas a damp glove or a glove wet from perspiration or any other cause has no insulating properties, and therefore should not be used.

Electrodes should be removed from the holders when not in use to eliminate danger from electrical contact with persons or conducting objects. Electrode holders, when not in use, should be so placed that they cannot make electrical contact with persons or conducting objects.

(e) Care of Welding Leads

The welding leads, both electrode and work, should be protected from damage to the insulation or to the conductor wires. Damaged leads should not be used. When a defect in a lead is found it should be reported immediately. Connections in the leads should be made with suitable metallic connectors and should be effectively insulated.

(f) Inspection and Maintenance

To ensure that all accessories are maintained in a safe and serviceable condition, a visual inspection of the welding machine, followed by an insulation resistance test, should be made at least once every 12 months, and welding leads, electrode holders, and so on should be inspected at least monthly by a competent electrician.

For their own safety, electric welders are urged to observe these precautions. In this way serious electric shocks may be reduced in A.C. welding.

—State Electricity Commission.

* * *

Arranging A Wall Vase

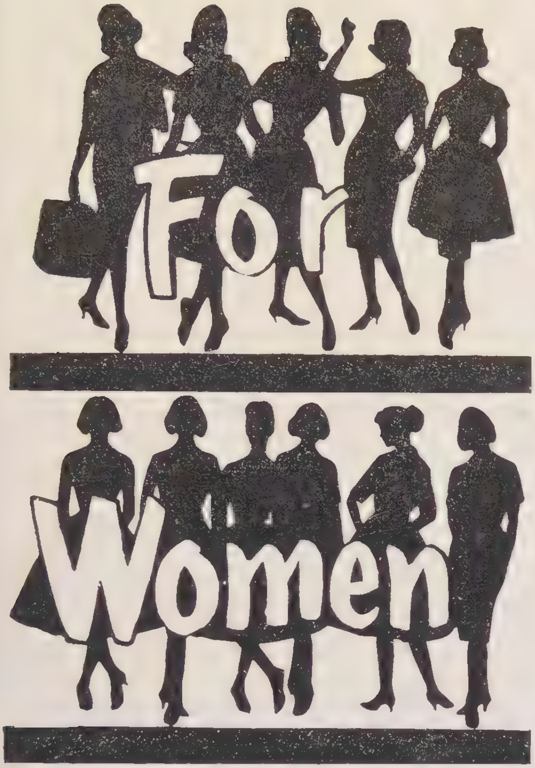
When arranging a wall vase the first and important point to bear in mind is that it is probably going to be looked up at. It therefore is necessary to place the vase at that level to arrange.

The most usual material for such arrangements is that which falls over the edge of the container and hangs well down. Plants which naturally grow downwards are the easiest to use, such as ivy, ivy geranium and similar vines.

As line, or silhouette, is the general effect, it is well to be careful not to use too much material. A good plan is to select and arrange first a good outline and firmly secure it. Crumpled chicken wire is probably the best holder for the tapering type of vase commonly used.

With these branches secure, now place a focal point of two or three blooms, a bunch of berries, or leaves of contrasting shade. Arrange them above and also partly falling over the rim of the vase, thereby breaking the line of rim.

Select a vase which suits your room for there is much contrast in wall vases and their types.



Short-cuts In Dressmaking

Well made, attractive garments can be made in less time and without sacrificing workmanship and serviceability by simplifying sewing.

In addition to contributing to time-saving by selecting easily handled fabrics, simple but well-designed styles, and the right sized pattern, much can be achieved by simplifying construction methods also.

Too much attention to detailed neatening and finishing can sometimes spoil the whole effect of line and style of a garment.

The well-illustrated, step-by-step instruction sheet is one of the best aids to the home dressmaker.

Each step is planned to ensure ease of handling and quick construction.

In addition, it is wise to study one of the dressmaking books published by the various pattern-making companies.

All are clearly and well illustrated, are revised frequently and are not too expensive.

Another aid is to observe the methods employed on ready-made garments—some of them can be adopted by the home dressmaker to her advantage.

Eliminating all tacking is not necessarily time saving—at times it can result in a whole section having to be unpicked, reset, tacked and restitched.

When tacking or basting is necessary to help achieve the desired result, then it is worthwhile.

Experienced dressmakers can, and do, save much time by pin-basting the simpler, more straightforward seamings.

Dressmakers in such a hurry that they haven't time to trim edges are sacrificing the professional finish.

For example, trimming the seam allowance of a curved collar, and clipping out small wedges around the curve to avoid lumpiness, save time in turning the collar.

A more even and flatter edge also results.

Where time is short it is better to select fabrics, or styles, that require little or no trimming.

Buttons, provided they are washable, can provide a quick and effective trimming—alternatively, accessories can take the place of time-consuming applied trimmings.

For children's wear flat trimmings, such as embroidered braids, are quick and easy to attach and are easy to iron.

Novelty embroidery stitches and simple, quick-to-make trims that give a professional look to an otherwise uninteresting garment may be made by modern machines and attachments.

For mothers of a young family this type of machine is a worthwhile investment.

Coat Linings

Coat linings in contrast or pattern have been a feature of recent fashions, but whether featured or not, a good lining adds to the appearance of a coat.

Linings also give added warmth, and many people have found milium—the insulated lining—both attractive and comfortable for this reason.

For those who live where the climate is very cold for some weeks during the winter an extra, detachable, lining will give extra warmth.

If made from one of the fur fabrics or new texture or shaggy woollen, glamour, as well as warmth, is added.

Interlinings which are put between the coating and the lining make winter garments snug and warm without adding bulk or weight.

However, an interlining to give warmth reduces the period for which the coat can be worn with comfort—but this will depend on the thickness of the interlining fabric.

Sometimes it is found sufficient to interline the back of the coat only.

It is well worthwhile for home dressmakers to explore the wide variety of interfacings now on the market.

They include canvas, linens, haircloth, muslins, organdie, and the non-woven fabrics, like vilene, in a variety of colours and weights.

A useful new tip is to interface the seam allowances each side of a zip fastener with vilene for extra neatness and firmness, also put a strip in a "kick pleat" to give a crisp look and prevent wrinkles.

Judging Skirt Lengths

The woman who aims to look as well as she can will heed, but not necessarily follow, fashion's decrees about skirt lengths.

The reason for this is that the length that suits a woman best depends on her figure type, her height and the length and shapeliness of her legs.

The style of skirt and sometimes the pattern on the fabric will also be an influence for the most attractive length.

This does not mean that a fashion trend for up or down should be completely ignored, it simply means that it is well to keep one's figure in mind when taking up or letting down.

Whether skirt lengths are in the news or not it is usually wise to check skirts and hems with each new season in case the fabric has dropped or some stiches have come undone.

When considering whether to alter the length of a skirt always undo the hem completely, press carefully on the wrong side, and pin to the new length.

Check the whole effect by standing—*and sitting*—in front of a long mirror.

Choose the length which is most flattering—remembering that the figure must be kept in proportion, because it is the overall effect which counts, not just from the hips down.

For this reason jacket lengths may have to be changed and sometimes, when the skirt has a hip yoke, altering the length of the skirt can completely upset the overall proportion.

An invisible, well-finished hem that is absolutely level is essential to a well-groomed appearance and worth whatever trouble is required to obtain it.

In general, it is easier and more successful to shorten than to lengthen skirts because of the difficulty of removing the crease and the stitch marks left by the old hem.

If the lengthening leaves an insufficient amount for a hem the wide bias strip which is available by the yard in a variety of colours is the solution.

Stiffening Fabrics

Some of today's fabrics, like yesterday's, need a little help to maintain their original stiffness after a number of launderings.

The British Good Housekeeping Institute has recently experimented to find the best methods to stiffen a problem material.

Starch, plastic stiffener, and gum arabic were the agents used.

A basic starch mix was made by mixing one heaped tablespoonful starch to a cream and adding two pints boiling water. This was diluted with 2 pints water when used for taiho and silk shantung.

The gum arabic was made into a solution by adding 2 oz. powdered gum arabic to ½ pint water in a jar and standing the jar in hot water until the powder dissolves. This was diluted as shown below.

Gum arabic was found the most satisfactory stiffening agent for taiho, silk shantung and taffeta (dresses).

Only a little stiffening is necessary to give body to taiho.

One teaspoon of the gum water to ½ pint water gave a good result, similar to original stiffness; 2 teaspoons to ½ pint made the fabric rather too stiff.

Starch gave a too stiff, patchy, and discoloured result, and the plastic stiffener (1 dessertspoon—1 to 2 pints water) resulted in a slightly patchy finish with poor handling quality.

Good "handle" with almost normal texture resulted from the use of 1 teaspoon gum water to ½ pint water; a stronger solution made the fabric too stiff.

Starch solution gave poor colour and a patchy finish. The plastic stiffener (1 dessertspoon—1 to 2 pints water) gave a matt appearance with a change in colour.

Gum water in the proportion of 1 teaspoon to ½ pint water is recommended to restore original stiffness to taffeta dresses—not underskirts. If slightly more stiffness is required use in proportion of 2 teaspoons to 1 pint water.

Removing Cosmetic Stains

Even women used to handling cosmetics with skill and care sometimes face the annoyance of having to remove stains caused by lipsticks, perfume, rouge, nail polish or some other item of makeup, but fortunately, most of these stains can be taken out by simple cleaning processes in the home.

If the fabric is washable, first wipe off carefully as much of the stain as possible, then just washing in warm, soapy water may be enough to take it out.

If the stain has set or is fairly heavy, loosen it first by rubbing with a little glycerine or lard, then rinse and launder as usual.

If traces of stain persist after this, test the fabric for colour fastness then try sponging with hydrogen peroxide and rinse well. Non-washable fabrics demand special treatment. First place a pad or piece of clean blotting paper under the stained portion.

Then sponge it with dry-cleaning liquid, or dip the stain in a little of the solvent.

Blot frequently with a clean blotter, and be sure to replace the pad from time to time as it takes up the stain.

Bleach with hydrogen peroxide if necessary, after testing for colour-fastness.

A little glycerine, lard, or vaseline could be worked into the stain to soften it up before sponging.

The first step in removing powder stains is to shake the garment out well, and brush it lightly with a soft brush.

Then sponge with dry-cleaning fluid.

Silk or woollen fabrics should be sponged with lukewarm soapy water before the cleaner is applied.

Sponge the stain carefully and lightly with pure acetone or amyl acetate, which can be bought at most chemists—but don't use acetone on acetate rayon fabric unless you want to see the fabric dissolve.

In any case, be sure to test the cleaner on an inconspicuous part of the fabric first.

Any lingering traces of colour can be bleached out of white cotton and linen by sponging first with water, then with hydrogen peroxide, then rinsing the fabric well.

That Word "Shortening"

It is always interesting to learn how a word or term comes to be used in a sense quite different from its more obvious, and generally accepted, meaning.

Here is the result of some research by home economists in the United States Department of Agriculture.

This group traced the background, use, and application of the words "short" and "shortening" as cooking terms.

They traced the word "short" through Old English, High German, Low German, Teutonic, and Latin.

For example, both the Teutonic "shkurt" and the Latin "ex cortus" meant "to break".

Thus, in addition to meaning the opposite of long, short has been given a second meaning—a crumbling, tender quality in food.

An English cookbook of the year 1430 praised a cake which "eats short".

"Shortening" as a cooking term first appeared in an English cookbook published in 1829.

Modern food chemists say that if flour and water are mixed, then studied under a microscope, the long strands of gluten in the dough can be seen. And when fat is added to the dough the gluten strands are seen to be literally shorter.

Thus the meaning of the word which means the opposite of long is also applied when "short" and "shortening" are used as food terms.

Drawer Partitions Useful

For those who "can't find anything in that drawer" Miss Nancy Foskett, Senior Extension Officer (Women's Service), New South Wales Department of Agriculture, recommends partitioning the drawer so that like things may be stored in the one compartment.

In the kitchen drawers this not only saves time but saves wear on the articles and, in the case of knives, sharp-edged and pointed tools, is much safer.

For knives, of course, one of the new type of racks, placed out of the reach of tiny hands, is an even safer and better method of knife storage.

Whether scraps of wallboard, ply, stiff cardboard, or wood from a cheese box is used for the partitions, be sure to make them removable to simplify cleaning and lining.

Sometimes a wooden or plastic cutlery box can be bought to fit a drawer. Failing this, wood or cardboard boxes can often be found to fit into the drawer and, when painted, are quite satisfactory.

A plastic sewing-tidy tray is ideal for a dressing table drawer.

A plastic fly-box from the fishing counter of a sports store is just the thing for ear-rings and small pieces of costume jewellery, whether in a drawer or in a holiday suit-case.

Deep Drawers

The "dead" space in the top half of a deep drawer can often be put to work by having a tray that will slide from front to back, or side to side.

If the bottom half of the drawer is partitioned the tray could run on the partitions; if not, a length of beading tacked down either end, or along the back and front of the drawer would provide runners.

The tray should be only half the width or length of the drawer, to allow easy access to the bottom of the drawer.

A deep drawer in the kitchen could be partitioned off from side to side to give filing-type storage for cake pans.

The distance between each divider would be governed by the depth of each cake pan.

Buying a Washing Machine?

With three types of washing machines available—automatic, semi-automatic and non-automatic—with various features incorporated by the different makers, choosing a washing machine is not easy.

Because a washing machine is a major piece of household equipment and is expensive, its purchase requires careful thought.

Cost is a factor that most have to consider. However, a costly machine is not necessarily the better one—for you.

The extra cost may be due to special features for which you have no need.

For this reason become familiar with what is available; with the various time-and-labour-saving features of each machine.

Analyse this knowledge in the light of—

(i.) Your needs;

(ii.) Your willingness to change laundering habits if necessary.

When checking the performances of various machines with their users, remember one cannot always judge by others' opinions, as individual standards vary.

Other factors to be considered are:

Power.—Required—available.

Water Supply.—In general, automatic and semi-automatic use more water than the non-automatic.

Hot water supply is an advantage with all types.

Water Disposal.—Drains for waste water are desirable. Non-automatic may be emptied by hand if necessary. With large volumes of waste water it may be best to by-pass septic tanks.

Taps.—Separate hot and cold water taps are necessary for automatic and semi-automatic machines, while a fitting that mixes hot and cold water is most convenient with non-automatic machines.

Installation.—No special installation is needed for non-automatic types, but may be for others.

Maintenance cost.—May be higher on automatic and semi-automatic ones. Be sure prompt, satisfactory repair service available.

Operating expenses.—Less for non-automatics, others slightly higher.

Check When Buying

- Amount of water required.
- Availability of hot water. Alternatively, consider heating unit in washer.
- Capacity in relation to family size. Studies have shown that a 6 lb. load washes better than the 8 to 10 lb. loads generally recommended.
- Placement of controls. They should be easy to reach and to operate, and their uses clearly indicated.
- Tub materials should be easy to clean and durable.
- General workmanship: Made from strong materials, well-braced and welded, free from sharp and rough edges; parts that come in contact with clothes rustproof; tub and motor mounted in such a way that noise and vibration will be reduced.
- Motor should be placed where it is shielded from water, grounded, and insulated from metal of the machine. A sealed-in lubricant that oils the machine permanently is desirable.

Wringer machines.—Look for safety features. Check the emergency release, type of rollers and pressure, convenience of controls, balance of machine with wringer in different positions.

Spinner machines.—Make sure drain board (if there is one) is high enough to fit over tub, check tap fittings and ease with which basket may be removed.

All non-automatics.—A separate motor switch on the machine; method of emptying—motor driven pump adds to cost, but saves time and energy and keeps water off the floor; a rubber gasket on the cover; height and manner of adjusting; casters on legs; a holder for the flex; a water line mark on the tub and a timer are useful extras.

—From N.S.W. Department of Agriculture's "Press Copy."

Demand For No-Shrink Wools

Demand for washable no-shrink wools has surprised manufacturers, and mills are working overtime to meet the demand. Exports of washable lightweight wool frocks, blouses and shirts to New Zealand have widened the demand.

Men's washable no-iron shirts are being bought up as fast as they can be produced.

By spring, classweave sironised wool fabrics will be in retail stores throughout Australia in dresses and piecegoods, shirts, blouses, dressing gowns, skirts, slacks and the new spring coats.

—Australian Wool Bureau.

Brucellosis-Tested Swine Herds

(As at 1st July, 1960)

Berkshire

Bernoth, B., Wyreema
Clarke, E. J., Mt. Alford, via Boonah
Cochrane, S., "Stanroy", Felton
Cook, F. R. J., Middle Creek, Pomona
Crawley, R. A., Rockthorpe, Linthorpe
Edwards, C. E., "Spring Valley" Stud, Kingaroy
Farm Home For Boys, Westbrook
Fletcher, A. C., "Myola" Stud, Jimbour
French, A., "Wilson Park", Pittsworth
H. M. State Farm, Numinbah
H. M. State Farm, "Palen" Stud, Palen Creek
Handley, J L., "Meadow Vale", Lockyer
Handley, G. R. "Lochlyn" Stud, Lockyer
James, I. M. (Mrs.), "Kenmore" Stud, Cambooya
Kath, E. E., "Topcamp", via Toowoomba
Kimber, E. R., Block 11, Mundubbera
Law, D. T., "Rossvill" Stud, Aspley
Lees, J. C., "Bridge View" Stud, Yandina
Ludwig & Sons, A. R., "Beau View" Stud, Beaudesert
O'Brien & Hichey, J., "Kildurham" Stud, Jandowae East
Orange, L. P., "Eula", Flagstone Creek
Pfrunder, P. L., Pozieres
Potter, A. J., Ascot, via Greenmount
"Tayfield" Stud, Taylor
Q.A.H.S. & College, Lawes
Regional Experimental Station, Hermitage
Rosenberger, N., "Nevrose", Wyreema
Rosenblatt, G., Rosevilla, Biloela
Schellback, B. A., "Redvilla" Stud, Kingaroy
Smyth, E. F., "Grandmere" Stud, Manyung, Murgon
Stark, H. L., "Florida" Stud, Kalbar
Thomas & Sons, F., "Rosevale" Stud, Laravale
Traves, G., "Wynwood" Stud, Oakey
Weier, V. F., "La Crescent", Clifton
Wolski, A., "Carramana", Warra
Young (Jnr.), W., Kybong, via Gympie

Large White

Assenbruck, C., Mundubbera
Barron Bros., "Chiltern Hill", Cooyar
Bell & Son, E. J., "Dorne", Chinchilla
Behm, A. M., "Aleun", Wondai
Bishop, C. E., Beerwah
Butcher, Dr. B. J. & Parnwell, A. J., Plunkett, via Tamborine
Clark, L. D., Greens Creek, Gympie
Coller, R. H., "Relloc", Tallegalla, via Rosewood
Duncan, C. P., "Colley", Flagstone Creek
Fowler, S., "Kenstan", Pittsworth
Franke, H. J., "Delvue" Stud, Cawdor
Garawin Stud Farm Pty. Ltd., 657 Sandgate Rd., Clayfield
Gibbons, A. E. H., Mt. Glorious
Gibson, H., "Thistleton" Stud, Maleny
H. M. State Farm, Numinbah
Hall, M., "Milena" Stud, D'Aguilar
Heading, J. A., "Highfields", Murgon
Hickson, K. L., "Warra", Calliope
Horton, C. J., "Mannuem Brae" Stud, Mannuem, Kingaroy
Hutton, G., "Grajea" Stud, Cabarlah
Jensen, S., Rosevale, via Rosewood
Jones, K. B., "Cefn" Stud, Clifton
Kahler, J. & S., "Karajoy", East Nanango
Kanowski, A., "Exton", Pechey
Kennard, R. B., "Collar" Stud, Warwick
Larsen, H. L., "Oakway" Stud, Kingaroy
Law, D. T., "Rossvill" Stud, Aspley
Lees, J. C., "Bridge View", Yandina
Lobegeiger, L. C., "Bremer Valley" Stud, Moorang, via Rosewood
Mack, A. J., Mundubbera
"Marcliff", Wecker Rd., Mt. Gravatt
Neilsen, L. R., "Sunny Hill," Ascot, via Greenmount
Neilsen, A. R., Ascot, via Greenmount
Palmer, V. P. & Son, "Remlap", Greenmount
Pampling, G., Watch Box Rd., Goomeri
Port Curtis Co-operative Dairy Association Ltd., Stud Piggery, Biloela
Postle, R., "Yaralla" Stud, Pittsworth
Powell, R. S., "Kybong", Gympie
Q.A.H.S. & College, Lawes
Radel, V. V., Coalstoun Lakes
Radel, R. M., Coalstoun Lakes
Regional Experimental Station, Biloela
Robinson, O. R. & O. J., "Linvale", Argoon, Biloela
Rosenblatt, G., Rosevilla, Biloela
Skyring, G. I., "Bellwood" Stud, via Goomeri
Stanton, H. R., "Tansey" Stud, via Goomeri
Stehn, L. W., "Hodgson Vale", via Toowoomba
Stewart, L., Mulgowie, via Laidley
Stumer, K. F., French's Creek, Boonah
Wharton, C. A., "Central Burnett" Stud, Gayndah
Wieland, L. C. & E., Lower Cressbrook, Toogoolawah
Zahnow, W., Rosevale, via Rosewood

Tamworth

Armstrong, H. J., "Alhambra", Crownthorpe, Murgon
Booth, J. D., Swan Creek, Warwick
Campbell, P. V., "Lawnhill" Stud, Lamington
Coller, R. H., "Relloc", Tallegalla, via Rosewood
Fletcher, A. C., "Myola" Stud, Jimbour
Herbst, L., "Hillbanside", Bahr Scrub, Beenleigh
Kanowski, S. E., "Miecho", Pinelands
Potter, N. R., "Actonvale" Stud, Wellcamp
Regional Experimental Station, Kairi
Salvation Army Training Home For Boys, "Canaan" Stud, Riverview
Skerman, D. F. L., "Waverley", Kaimkillenbun
Stephen, T., "Withcott" Stud, Helidon
Thomas & Sons, F., "Rosevale" Stud, Laravale
Wieland, L. C. & E., Lower Cressbrook, Toogoolawah

Wessex Saddleback

Ashwell, J., "Green Hill", Felton South
Cooper, G. J., Neumgua
Douglas, W., "Greylight" Stud, Goombungee
Dunlop, J. B., "Kunawyn", Acacia Rd., Kuraby
Kingsford, D., "San Antone", Toowoomba
Kruger & Sons, "Greyhurst" Stud, Goombungee
Law, D. E., "Homevale", Goombungie
Law, D. T., "Rossvill" Stud, Aspley
Mack, A. J., Mundubbera
Scott, A., Wanstead Stud, Grantham
Smith, C. R., "Belton Park", Nara
"Wattledale" Stud, 432 Beenleigh Rd., Sunnybank

Landrace

Ashwell, J., "Greenhill", Felton South
Behm, A. M., "Aleun", Wondai
Crawford, G. L., "Glenvillan", Manneum
Crothers, B. M., "Booligar", Clifton
Duncan, C. P., "Colley", Flagstone Creek
Fowler, K. P., "Northlea", Coalstoun Lakes
Grayson, D. G., Killarney
Kath, E. E., "Topcamp", via Toowoomba
Kingsford, D., "San Antone", Toowoomba
Law, D. J., Rossville Stud, Aspley
Lush, P. B. I., Westbrook
Neilsen, A. R., Ascot, via Greenmount
Orange, L. P., "Eula", Flagstone Creek
Semgreen, A. L. & D. T., "Tecona", Kingaroy
Stehn, L. W., "Hodgson Vale", via Toowoomba
Stummer, K. F., French's Creek, Boonah

Large Black

Pointon, E., Goomburra

11 Points In Managing Irrigated Pasture

By C. A. SCHRODER, Assistant Irrigationist.

An experiment extending over three years was rried out at the Gatton Regional Experiment tation to examine the effects of a number of ractices on an irrigated pasture consisting of e irrigation strain of white clover, cocksfoot, alaris and H1 rye-grasses.

It was found that some treatments had isastrous results. They quickly lowered the rowth rate and quality of the pasture and lowed it to become weedy and uneven. It was so found that high production, good quality d evenness of cover could be maintained for ng periods by sound management practices.

As a result of the experiment, certain recom- endations have been made. These have given xcellent results at the station and may be taken a guide for pasture growers. Their adoption ill lengthen the life of the stand, ensure aximum return, maintain evenness of the asture cover and provide efficient grazing of the asture produced. The recommendations are:

(1) To maintain vigour, high production, venness of sward and desirable grass/clover tio, this type of pasture should be grazed as frequently as possible. However, grazing spells ould not be long enough to allow the pasture lose food value or become unattractive to ock.

The length of spell should vary with the ason. Twenty to 30 days is often quite satis- ctory in spring and summer, while in autumn d winter six or eight weeks may be desirable.

Think of Lucerne

About eight grazings a year is a good figure. A good idea is to think of a lucerne crop. Farmers know well that for best results this crop should not be harvested until it has reached the right stage. A vigorous stand of irrigated lucerne usually provides eight or nine cuts a year, the length between cuts varying with season. Mowing before the lucerne is ready is detrimental to the crop—if done occasionally the harm is not great, but if persisted with, will soon ruin the stand by severely weakening the plants and allowing weeds and grass to take control. In this respect pasture and lucerne are alike. Grazing before the pasture has reached grazing condition is one of the commonest malpractices noticed.

(2) Efficient spreading of manure should be done as soon as possible after grazing.

This operation should not aim at any cultural effect, but should effectively spread a manure pat over a distance of eight or 10 feet.

(3) Particular care should be taken not to allow heavy defoliation at any time. Probably no other single practice will as quickly make an invalid out of a healthy plant. The combination of too hard and too frequent grazing is pasture enemy number one. Care against overgrazing is important all the year round but particularly so in hot weather when exposed soil can become hot enough to kill out many temperate plants. When that happens weeds and paspalum soon take over and the pasture loses its identity.

(4) A long spelling period with deferment of grazing or hay-making should be given each year if possible.

A long spell restores vigour and is particularly beneficial to weakened plants. It may be likened to an annual holiday; although it may not be considered necessary or desirable beforehand it is always attended by good results. It not only restores vigour but does a great deal to remedy any unevenness in the pasture cover.

Deferment of grazing in late summer and autumn actually increases the amount of grazing provided and at this period succulence and food value are maintained for long periods. Deferment of grazing is actually a short-term (8 to 12 weeks) fodder conservation scheme by which pasture grown in late summer and autumn can be held over on the stalk and grazed in winter. There are neither conservation nor feeding-out costs, while high nutritive value is maintained.

The inclusion of hay making in the pasture programme means that growth produced in the better growing portions of the year can be conserved until required. The irrigated pasture can thus play a part in the overall fodder conservation programme on a property. Hay making does not result in a loss of animal return to the pasture if the hay is fed back in the paddock. Good quality baled hay made from white clover, phalaris, cocksfoot and rye-grass is preferred to baled lucerne hay by both cattle and sheep on the Gatton station.

By deferment of grazing and hay making, the carrying capacity of a pasture can be evened out over the year.

(5) Every effort must be made to maintain evenness in the pasture cover at all times.

Maintenance of an even pasture cover should be regarded as the most important item in pasture management.

Efficient grazing can never be obtained while the pasture cover is uneven. Why plant, irrigate and grow pasture and then waste a lot of it by inefficient grazing? The evenness of the cover also very greatly influences persistence and production of the planted species, invasion by weeds, efficient use of soil moisture, and loss of soil moisture by evaporation.

It can safely be said that the whole condition of a pasture, its productivity, and the efficiency of the total management used are all evidenc
by the evenness or otherwise of the pasture cov
at any season.

(6) Pattern grazing, that is unevenness
cover, should be corrected as soon as it becom
evident.

For this correction, any manure pats prese
must be thoroughly spread, and the pasture give
one or more fairly long spells followed by mowin
if possible or very light grazing.

Evenness of pasture cover and efficient grazin
are best maintained by a judicious combinatio
of grazing, and hay making.

(7) When a heavy body of pasture is to
grazed, loss from trampling and fouling can
largely eliminated if grazing is controlled wit
an electric fence and stock allowed only a narro
strip at a time. As far as possible the stoc
should be forced to graze "under the fence" b
too heavy grazing must be avoided.

(8) The need for fertilizer application mu
be watched, and timely application made accor
ing to the prevailing conditions.

Sound irrigation practices must be followed.

Look on it as a Crop

(9) The pasture grower would be wise
learn to regard his pasture as a sown crop a
to manage it to obtain maximum returns. *Th
entails grazing it to suit the growth habit of t
pasture.* Grazing whenever the animals requi
pasture regardless of the condition of the pastu
should be regarded as a crime against dece
pasture.

If sufficient irrigated pasture is not availab
to meet the full requirements of the animal
provision of unirrigated pasture, forage crops
conserved fodder is essential.

(10) The provision of an irrigated pastu
does not reduce the necessity for good manag
ment of dry pastures nor do away with th
necessity of conserving feed for periods of slo
growth or drought.

(11) The development of an appreciation
weakened plants is necessary. Proper manag
ment will not only foster their recovery but w
arrest depreciation of vigour generally.

Success In Dairying Through Sound Management

By R. T. WESTON, Dairy Adviser,
and N. J. DOUGLAS, Adviser in Agriculture.

A Kenilworth dairy farmer has doubled the production of his dairy herd in the last five years. Furthermore he has maintained a steady increase in production from year to year despite variations in seasonal conditions.

The farmer is Mr. S. Passlow, of Booloumba, ear Kenilworth, and the average production of is herd has increased from 113 lb. to 254 lb. utterfat per cow. This is an increase of 125 er cent. and represents an estimated £1,120 etter return for 1958-59 as against 1954-55.

Mr. Passlow's success is due to a comprehen- ve pasture improvement programme in associa- on with herd recording. Correct pasture and erd management, individual feeding, cowman- nip, and disease control have also played their art.

Herd Recording and Management

Mr. Passlow commenced herd recording five ears ago. At that time the production of his erd was very low. As he considered this osition was largely created by the use of inferior ulls and lack of suitable feed, a programme of asture improvement and recording was initiated.

Culling has been strict; females are culled for ow production and for short lactation.

The culling and feeding programme has been effective that the average length of lactation or the herd has been increased from 175 days 1954-55 to 278 days in 1958-59, an increase f 103 days.

Initially it was necessary to purchase animals to take the place of the disposals, but now sufficient heifers are available for normal herd replacements. It is noteworthy that the size of the herd has been maintained at a constant level throughout the five-year period.

It has been shown consistently by herd recording data that farmers who record their herds continuously over an extended period are able to make better use of the information provided. Those who record continuously are usually able to show better progressive production than farmers recording for only one or two seasons. The results achieved by Mr. Passlow (see Table 1) show that continuous recording pays dividends.

TABLE 1

—	1954–55	1955–56	1956–57	1957–58	1958–59
Average butterfat per cow (lb.) ..	113	161	205	218	254
Number of cows ..	39	37	40	38	41
Average length of lactation (days) ..	175	261	261	287	277

Mr. Passlow believes that the basis of sound herd management is production recording. He says that he could not have achieved the same results without it. The information provided enabled him readily to assess the affect on productivity of his husbandry practices.

No Dry Paddocks

Perhaps one of the most important factors determining production on this farm is that there is no dry paddock used as such. All the dry cows are run with the milkers throughout the year. This means that each cow receives the same high class roughage irrespective of her stage of lactation or gestation.

Plate 1

Controlled Grazing With Electric Fence, on the Property of Mr. S. Passlow, of Booloumba, near Kenilworth.

It has been shown that the condition of the cow at calving has a strong influence on the length of lactation. It also has a similar effect on production. By calving his cows in the very best of condition, Mr. Passlow is helping to ensure a profitable level of production as each cow is well equipped to commence her lactation.

A sound calf rearing programme has also been adopted. Each calf, having been with her mother for at least a full day, is fed with wholemilk at the rate of 1 gal. a day for one week. Thereafter, skim-milk is used to gradually replace the wholemilk. A concentrate is added to replace the fat when the calf is receiving skim-milk onl Mr. Passlow aims to keep his calves on skim milk until they are approximately 6 months ol

Calves are regularly drenched for the contr of worms and the rotational grazing of paddock helps to keep parasitic infestation to a minimum

The Departmental Bull Proving Scheme, c which Mr. Passlow is now a member, has bee responsible for the provision of 34 heifer calve on the property. These range from one mont to three years. Five are already in productio and under Mr. Passlow's system of manageme these heifers will not be handicapped by adver environmental conditions. They should be ab to produce to the maximum of their inherit capacity.

Pasture Improvement

After growing maize and oats for 25 year Mr. Passlow planted an initial 7 acres of pastu in 1955. At the present time, 5 acres of th original pasture are still producing high quali feed. In 1958, 2 acres of this original ar were ploughed and planted with a lucerne/clov mixture.

Plate 2

Well-Constructed Trough Serving Two Paddocks.

Each year after this initial planting, additional areas have been sown. In 1956, he planted acres of pasture, in 1957, an additional 3 acres of lucerne. In 1958, 2 acres of lucerne/clover mixture were sown. Also in 1958, 8 acres of land were prepared for contour ditch irrigation and the original paspalum and white clover was oversown with Ladino and Montgomery clover.

The basic planting mixture used consisted of New Zealand and Ladino white clover, Montgomery red clover, lucerne and Hl ryegrass. In earlier mixtures cocksfoot and phalaris were also included.

Until 1957, the clovers were grown under dry-and conditions but now Mr. Passlow shares an irrigation plant with his neighbour. This equipment comprises 11 chains of 4 in. main and chains of 3-in. spray line. A 2½ to 3 in. entrifugal pump is driven by an economical 6 h.p. diesel engine. The quantity of water ut on is dependent on weather conditions. During summer, when the rate of evaporation is high, the equivalent of 2 in. of rain is applied about every 10 days. Less water is necessary during the cooler months.

Thorough seedbed preparation has played a most important part in the successful establishment of these pasture species. After the initial ploughing, a fine tilth is obtained by discing the soil several times. In such conditions, moisture is retained for longer periods and maximum germination is assured. Mr. Passlow considers that the extra time spent on soil preparation can make all the difference between success and failure in pasture establishment.

Although Mr. Passlow has a total farm area of 240 acres, the bulk of the production comes from the 60–70 acres of creek frontage. The remainder of the farm is steep forest country.

Pasture Management

All pasture land was topdressed with ½ ton of lime and 1½ bags of superphosphate at planting time and each year all the pastures are topdressed with 1½ bags of superphosphate to the acre. This

Plate 3

Contour Ditch Irrigation.

treatment is carried out each autumn, and involves the annual purchase of 60 bags of fertilizer. Mr. Passlow considers the outlay well worthwhile, thus ensuring a continuous supply of good quality pasture.

To use feed efficiently, both strip and rotational grazing have been adopted. Over-grazing is guarded against because of the major disadvantages of drop in pasture quality. This is an important factor where soil temperatures are high during the summer months. A quick regrowth is assured when over-grazing is not practised. Pastures are never grazed closer than 4 to 6 in. from the ground. By this means, soil moisture is preserved and weed growth kept to a minimum.

The pastures are subdivided into strips of two-thirds of an acre with semi-permanent electric fences. The electric fence unit is located in the milking shed and overhead wires carry the current to various paddocks of the farm.

These small strips are rotationally grazed approximately every 6 weeks. Each strip usually lasts 2 days, being grazed on an average of 1½ hours a day. Grazing is sometimes divided int three periods as a control against bloating, an the cows appear to consume more feed by thi method. This system of management has pai dividends. It can only be used when there i sufficient pasture to provide continuity of fee The average number of cows grazed is 45.

The pastures are mowed for weed contr when warranted. If a strip is to be mowed, it i done immediately after grazing. The mower i also used for controlling rank growth in the ope paddocks. It is a most valuable piece o machinery as far as pasture management is con cerned because the palatability of the pasture i retained for a much longer period.

Apart from the area sown to improved pasture the usable portion of the farm is divided into paddocks. These provide supplementary grazin after the cows have obtained their main require ments from the highly improved pastures on th creek flats.

Feeding

The increase in production of this herd coul not have been obtained without the provision uitable feed, and this is where the pasture nprovement programme has indicated its value. y continuous pasture feeding during the day, ombined with the supplementary feeding of concentrates in the bails, the herd has been able to roduce at a high level.

About 5 acres of maize are grown each year o provide grain for the cows and pigs. Each ow receives a basic ration of approximately lb. of crushed maize a day. Heavy producers eceive an additional amount according to their evel of production. When no maize is available mixed dairy meal of approximately 18 per ent. protein is fed. Mr. Passlow finds that it is nly necessary to feed this concentrate supplement for an average of 4 months each year.

In addition to grain supplements, a phosphate upplement is provided for all stock. This is laced in a number of wooden troughs conveniently situated near the milking shed, and each animal is able to obtain it at will.

One of the most valuable assets with which any dairy farm can be endowed is an ample supply of good water. Stock, especially milking cows, are unable to make the best of the fodder consumed unless a plentiful supply of water is readily available.

Plate 4

Water is Reticulated to Milking Shed and Troughs from this 11,000 Gal. Storage Tank.

Mr. Passlow's animals have access to water 24 hours a day. A windmill delivers water to a 11,000 gal. concrete tank situated on high ground near the house. Water is then reticulated to the milking shed and to a trough adjacent to the yard. This trough provides water for three paddocks. The provision of water in all paddocks ensures that stock are able to obtain sufficient not only for normal requirements, but the extra quantity necessary for high producing cows.

Cowmanship

Mr. Passlow is a great believer in "cowmanship". He realises that cows are creatures of habit and react favourably to regular practices. The handling of the stock during grazing, and their subsequent transfer to other paddocks, are performed without undue haste or bustle.

A visitor to the farm soon realises that the herd is well managed. Cows pass through the bails quickly and smoothly on a well-ordered system. There is no doubt that the handling of the herd during milking and at all other times has contributed to the present high level o production.

The provision of adequate quantities o good quality pasture, carefully managed, ha undoubtedly been a major factor in attaining th present level of herd production. Continuou herd recording has provided the informatio necessary for best use of available fodde resources, and the history of each animal is bein gradually built up to form the basis of a futur breeding programme. This, together with car and regularity in all farm operations, has prove to be a basis for successful farming.

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Save On Costs of Fertilizer For Pineapples

By **R. C. CANNON**, Senior Horticulturist.

Pineapple growers can now cut their fertilizer costs by as much as 50 per cent. Experiments at Maroochy Experiment Station show that less fertilizer and less labour are required when a pre-planting mixture is used followed by regular urea sprays after planting.

The time-honoured method of fertilizing pine-pples by applying fertilizer to the base leaves f pineapples will, before long, give place to an asier and more efficient method. Power sprays vill do a job that for many years has been one by hand, and one more back-breaking task ill disappear from the pineapple grower's utine. Less fertilizer will be wasted and money ill be saved.

Base leaf fertilizing is convenient when the ork has to be done by hand, but has no other ecial merits. Practically none of the fertilizer absorbed directly through the leaf bases; it as first of all to be carried to the soil by rain-ater collected in the trough-like leaves and then ken in by the roots. As a method of side-ressing, there is less risk of fertilizer being ashed away than when it is thrown on to the urface of the soil. Very little rain is needed to issolve the fertilizer and carry it down to the il.

Urea foliage sprays are a cheap and efficient ay of supplying nitrogen to pineapples and ave several advantages over base leaf applica-ons of sulphate of ammonia. Phosphorus and otassium are rarely applied as sprays and are sually put into the soil as a basal dressing or side-dressings. The latter have been used in neapples primarily because of the necessity for equent applications of nitrogen, which is cluded in the mixture.

The possibility of applying potassium fertilizer a pre-planting mixture was recently investi-ted at the Maroochy Experiment Station.

Less Potassium

Being the main constituent of pineapple fertilizer mixtures, potassium was the first to be investigated. The work is not yet complete, but sufficient information has already been obtained to indicate that a pre-planting application of sulphate of potash is not only satisfactory, but also commercially desirable. When applied directly to the soil in a basal dressing, much less was needed to produce the same tonnage of fruit in the plant crop than is used in regular base leaf applications. Plants that received no potassium other than the pre-planting application made better growth and gave a slightly higher yield.

Ratoon crop results are not yet complete but the indications so far are that the amount used in this trial will prove sufficient for a ratoon crop as well. Even when these results are known, further trials will be necessary to determine the minimum requirements for different soils and for different plant spacings. However, from what is already known, an estimate has been made of the maximum amount necessary for a full cycle.

In the trial, the fertilizer was spread over the surface of the planting bed by hand and worked lightly into the soil with fork hoes. This is a fairly quick and easy way of putting on the fertilizer. With a little ingenuity, growers will soon devise better methods, using fertilizer distributors where the area warrants it. The fertilizer can be worked into the soil with disc harrows or other implements already available on the farm.

Pineapples need a great deal of potassium, and growers want to get the most they possibly can out of every pound they use. The economy in fertilizer, quite apart from the saving in labour, is worthwhile.

Plate 1

Pineapples on the North Coast. The crop is planted on the contour. Note waterway in the foreground.

Urea Foliage Sprays

Urea sprays are not new; they have been used on a limited scale in Queensland for some years. They can be applied quickly and easily with power spray equipment which is used on most pineapple farms for weed spraying. Even with a knapsack spray, a man can cover twice the area in a day that he could fertilize by hand.

Because urea is taken in directly through the leaves, the spray acts almost immediately. Base leaf applications of sulphate of ammonia, on the other hand, need at least some rain after they are applied before the nitrogen becomes available, and it may often be weeks before the plants get any benefit. Even in the usual dry winte when growth is normally slow, urea foliage spray are moderately effective.

A further advantage of urea spraying is that does away with the acidifying effect on the soi of sulphate of ammonia. On many farms, co tinued use of this fertilizer over a long peri has made soils too acid even for pineapples a growers have to apply lime to correct exce acidity. The principle of foliage spraying is put on just enough to wet the leaves, with minimum of run-off to the soil. Even if some the spray does run down to the ground, th urea does not acidify the soil like sulphate ammonia.

Because of the limited amount that can be p on at a time, urea foliage sprays have to applied every two months. This is more ofte than base leaf applications of fertilizer are usuall ade, but the ease and speed of spraying more an compensate for this. Although it appears be expensive, urea is actually a relatively ieap source of nitrogen. One ton of urea con- ins as much nitrogen as two and a quarter ns of sulphate of ammonia.

he New Way

Although investigations are not yet complete, ineapple growers can take advantage of what known, bearing in mind that present recom- endations are only tentative and may have to modified later.

Plate 2

A Full Crop of Pineapples Shortly Before Harvesting. A crop like this is the reward of good management, one phase of which is the efficient use of fertilizers.

An 0-4-37 fertilizer mixture is now available ommercially. For most soils 1,000 lb. to the cre of this pre-planting mixture will be sufficient r a plant and one ratoon crop. This supplies 00 lb. of superphosphate and 750 lb. of sulphate potash to the acre. In areas subject to rookneck" the addition of 28 lb. each of copper lphate and zinc sulphate is necessary. These gredients may be included in the fertilizer ixture applied before planting.

The only fertilizing necessary from then on can done by means of urea sprays applied every o months. Commercial urea contains an impurity known as biuret, which causes yellowing and withering of the leaf tips of pineapples. It is, therefore, advisable to see that the urea you use has a low biuret content, preferably not over one quarter per cent. The usual spray concentration used for pineapples is 10 per cent., that is, 1 lb. of urea to 1 gal. of water.

The spray is applied as a fine mist to thoroughly wet all the leaves, but no more. Should there be any excess to run off, it will not do any harm and will be utilized by the roots in the same way as any other nitrogen fertilizer in the soil. However, absorption through the leaves is the basis of this method.

The quantity of spray to the acre will depend on the size of the plants. As a guide, young plants will take about 30 gal. to the acre, and this amount will go up to about 50 gal. for fully grown plants. This means that, as the plants grow and their needs increase, they automatically receive more nitrogen at each spraying.

In areas such as the Mary Valley, where iron sprays are used to correct a manganese-induced iron deficiency, iron sulphate can be included with urea in the spray. The usual quantity of 5 oz. to 1 gal. may be added to the 10 per cent. urea spray. Where iron is included, however, special care is necessary to avoid any run-off, which may cause burning.

Big Saving

The new method of fertilizing pineapples is much less costly than the old. At present prices, about £50 an acre will buy the pre-planting fertilizer and urea needed to produce a plant and one ratoon crop. Under the old system of base leaf fertilizing the cost would be something like £100 per acre, or even more with close spacing between plants.

Every pineapple grower wants to save as much fertilizer as he can, provided he can be reasonably sure of not losing tonnage. Trial results show that this can be done and that you can save labour into the bargain. It will not be long before every pineapple grower adopts these improved methods of fertilizing his crop. Those who have already made the change are enthusiastic.

Tuberculosis-Free Cattle Herds

(As at 1st August, 1960)

Aberdeen Angus

Crothers, G. H. & H. J., "Moorenbah", Dirranbandi
Elliott, A. G., "Ooraine", Dirranbandi
Mayne, W. H. C., "Gibraltar", Texas

A.I.S.

Cox, T. L. & L. M. J., Seafield Farm, Wallumbilla
Crookey, J., Arolla A.I.S. Stud, Fairview, Allora
Davis, W. D., "Wamba", Chinchilla
Dennis, L. R., Diamondvale A.I.S. Stud, Mundubbera
Edwards Bros., "Spring Valley" A.I.S. Stud, Kingaroy
Evans, E. G., Lauraven A.I.S. Stud, Maleny
Green, D. B., Deloraine A.I.S. Stud, Fairdale
Heading, C. A., "Wilga Plains", Maleny
Henry, Mrs. K., Greenmount
Henschell, W., "Yarranvale", Yarranlea
H. M. State Farm, Numinbah
Littleton, H. V., "Wongalea", Hillview, Crow's Nest
Marquardt, A. C. & C. R., "Cedar Valley", Wondai
McShane, A. H., Handford Road, Zillmere
Mears, G. S. & E., "Morden", M. S. 755 Toogoolawah
Moore, S. R., "Sunnyside", West Wooroolin
Neale, D. G., "Groveley", Greenmount
O'Sullivan, Con., "Navillus", Greenmount
Pinwill, A. A., Gaylands A.I.S. Stud, Gayndah
Power, M. F., "Barfield", Kapaldo
Messrs. Mitchell and Mulcahy, Rosenthal
Queensland Agricultural High School & College, Lawes
Radel, R. R. & Sons, "Happy Valley", Coalstoun Lakes
Roche, C. K., Freestone, Warwick
Sanderson, W. H., "Sunlit Farm," Mulgildie
Schloss, C. J., "Shady Glen", Rocky Ck., Yarraman
Scott, M. E. & E., "Wattlebrae" A.I.S. Stud, Kingaroy
Scott, W. & A. G., "Walena" A.I.S. Stud, Blackbutt
Shelton, R. A. & N. K., "Vuegon" A.I.S. Stud, Hivesville, Murg
Estate Sokoll, A. H., "Sunny Crest", Wondai
Sperling, G., "Kooravale", Kooralgin, Cooyar
Sullivan Bros., "Valera", Pittsworth
Sullivan, D., "Bantry", Pittsworth
Sullivan, F. B., "Fermanagh", Pittsworth
Thompson, W. H., "Alfavale", Nanango
Webster, A. H., "Millievale", Sabine, via Oakey
Wieland, A. W., "Milhaven", A.I.S. Stud, Milford, via Boona

Ayrshire

Dudgeon, C. E. R., Marionville Ayrshire Stud, Landsborough
Dunn, T. F., "Alanbank", Gleneagle
Goddard, B., Inverell, Mt. Tyson, via Oakey
Holmes, L., "Benbecula", Yarranlea
Mathie, E. & Son, "Ainslie", Maleny
Scott, J. N., "Auchen Eden", Camp Mountain
Zerner, G. F. H., "Pineville", Pie Creek, Box 5, Post Offic
Gympie

Friesian

Behrendorff, E. C., Inavale Friesian Stud, M.S. 786, Boonah
Macdonald, S. E. G., "Freshfields", Marburg
Naumann, C. H., "Yarrabine", Yarraman
Pender, D. J., Lytton Road, Lindum
Stumer, A. O., Brigalow, Boonah

Guernsey

Doss, W. H., Degilbo, via Biggenden
Fletcher, A. B., "Cossart Vale", Boonah
Holmes, C. D. (owner Holmes L. L.), "Springview", Yarraman
Johnson, G. L., "Old Cannindah", Monto
Miller, G., "Armagh Guernsey Stud", Armagh, M.S. 428, Grantham
Ruge, A. & Sons, "Woowoonga", via Biggenden
Scott, C., "Coralgrae", Din Din Rd., Nanango
Swendson, A. C., Coolabunia, Box 26, Kingaroy
Wissemann, R. J., "Robnea", Headington Hill, Clifton

Jersey

Beckingham, C., Trout's Rd., Everton Park
Birt, W. C. M., Pine Hill Jersey Stud, Gundiah
Borchert, Mrs. I. L. M., "Willowbank" Jersey Stud, Kingaroy
Burrows, R. N., Box 23, Wondai
Bygrave, P. J. L., The Craigan Farm, Aspley
Carpenter, J. W., Flagstone Ck., Helidon
Conochie, W. S. & Sons, "Brookland", Sherwood Rd., Sherwood
Crawford, R. J., Inverlaw, Kingaroy
Farm Home For Boys, Westbrook
Fowler, P. & Sons, "Northlea", Coalstoun Lakes
Harley, G., "Hopewell", M.S. 189, Kingaroy
H.M. State Farm, Palen Creek
Hutton, D. R., "Bellgrath", Cunningham, via Warwick
Johnson, H. G., Windsor Jersey Stud, Beaudesert
Lau, J. F., "Rosallen", Goombungee, Toowoomba
Matthews, E. A., "Yarradale", Yarraman
McCarthy, J. S., "Glen Erin", Greenmount, Toowoomba
Meier, L. E., "Ardath Stud", Boonah
Noone, A. M. & L. J., "Winbirra", Mt. Esk Pocket
Porter, F., Conondale
Q.A.H.S. & College, Lawes
Ralph, G. H., "Ryecome", Ravensbourne
Scott, Est. J. A., "Kiaora", Manumbar Rd., Nanango
Semgreen, A. L., "Tecoma", Coolabunia
Seymour, B. T., "Upwell" Jersey Stud, Mulgildie
Smith, J. A. & E. E., "Heatherlea" Jersey Stud, Chinchilla
Tatnell, W. T., Cedar Pocket, via Gympie
Toowoomba Mental Hospital, Willowburn
Verrall, F. W., "Coleburn", Walloon
Weldon Brothers, "Gleneden" Jersey Stud, Upper Yarraman

Poll Hereford

Anderson, J. H. & Sons, "Inverary", Yandilla
Hill, W. W., Mathalla
Hutton, D. R. & M. E., "Bellgrath", Cunningham, via Warwick
Maller, W., "Bore View", Pickanjinnie
Maller, W., "Bore View", Gowrie Junction
McCamley, E. W. G., "Eulogie Park", Dululu
Wilson & McDouall, Calliope Station, Calliope

Poll Shorthorn

Leonard, W. & Sons, Welltown, Goondiwindi
Yamburgan Pastoral Company, Noondoo

lew Drugs Aid Rearing)f Table Chickens

By P. D. RANBY, Veterinary Officer.

New drugs for preventing coccidiosis could ange the method of rearing chickens for table rposes in Queensland. When slaughtered at to 3½ lb. body weight, these chickens are own as broilers by poultry farmers.

With the aid of nicarbazine and zoalene, these ickens can now be reared on the ground as ccessfully as on wire floors. Ground rearing table chickens in intensive pens has certain lvantages over the use of wire floors.

Coccidiosis has always been a hazard in ground aring of chickens. This disease is caused by inute animal parasites which attack various rts of the intestine. Although there are seven ecies of coccidia in the domestic fowl, only ree of them cause harm to the birds under dinary conditions. Immunity is developed to ch species but immunity to any one affords protection against the others.

The main forms of coccidiosis are:—

(1) *Caecal Coccidiosis.*—Caused by *Eimeria nella* which attacks the two caeca or blind-ouches of the bird, causing severe bleeding. hickens are affected usually at 4 to 8 weeks. hese young birds appear very depressed (see ate 1), huddle together with drooped wings d pass blood in their droppings. Losses may high.

(2) *Intestinal Coccidiosis.*—Caused typically *Eimeria necatrix* which attacks the small testine, especially in its middle third. The sease is acute in younger chickens (acute testinal coccidiosis), resembling caecal cocciosis except that blood is scanty or absent in the droppings. As in the caecal form, deaths are a feature. The form seen in older chickens is chronic intestinal coccidiosis which is associated with unthriftiness and loss in weight.

(3) *Duodenal Coccidiosis.*—Caused by *Eimeria* acervulina which attacks the duodenum (first portion of the small intestine). This form is not so severe as the caecal and intestinal forms but causes a growth depression and affects food conversion adversely in older chickens.

The remaining species inhabit the small intestine but ordinarily cause little or no ill-effect.

Coccidia are ingested by the birds from the litter in the form of oocysts which are resistant, egg-shaped bodies. Inside the intestine of the bird, coccidia pass through a complicated cycle. Since this cycle takes about one week, and one oocyst reproduces several hundred thousand in one cycle, a build-up of coccidia may soon occur.

How Drugs Work

Coccidiostats, or drugs which prevent coccidiosis, are supplied continuously in the mash until the birds are ready for slaughter. These drugs act by hindering the development of coccidia in the intestine of the chicken so that coccidiosis does not occur. It is of note, however, that the different species of coccidia respond differently to the various drugs. Thus *Eimeria necatrix* infection responds more effectively to nicarbazine and nitrofurazone, whilst these drugs are inferior to the sulphonamides in combating *Eimeria acervulina* and *Eimeria maxima.*

Since table chickens are maintained on the drug continuously, the development of immunity should be of no consequence.

Drugs Used

Nitrofurazone (sold under different trade names) was first used as a coccidiostat here about 5 years ago and results have been variable. This drug may not be so effective where a heavy build-up of coccidia has occurred.

Nicarbazine was the first really effective drug available to prevent coccidiosis, and has been used by poultry farmers in Queensland for more than two years. More recently, zoalene has appeared and seems to be as effective as nicarbazine. Zoalene has the advantage that it can be used either as a preventive or at higher doses for treating outbreaks. Nicarbazine is a preventive only.

Some other recent drugs have appeared overseas but may not be marketed here unless they have advantages over the ones already available. One of these new coccidiostats called glycarbylamide gave excellent results at first, but fell into disrepute when it was found that coccidia quickly developed a resistance to it.

Prevention Preferred

In table chickens, prevention of coccidiosis outbreaks is preferred to treatment. Even though drugs used for treatment (zoalene and the sulphonamides) may reduce the number of deaths and check an outbreak, the birds still suffer a setback. Such a setback must be avoided at all costs in the case of table chickens owing to the smaller margin of profit.

Effect on Rearing Methods

In south-eastern Queensland, table chickens have been reared mainly on wire floors. The wire floor rearing is of two types: colony cages (especially in the case of table chickens under 2½ lb.) and wire-floored intensive houses holding large flocks (up to 500 birds). The colony type cages may be in a shed or in the open. This method of management has been adopted mainly to avoid coccidia.

On the central coast, ground rearing of table birds on litter has been practised for many years, while on the far north coast a swing to chicken raising by this method has taken place over the last few years. Coccidiosis has proved to be troublesome under these conditions. Howeve with the advent of nicarbazine, several larg chicken producers claim almost complete succes in coccidiosis control. Previously nitrofurazon had been used but an occasional "break through the drug by coccidia occurred while regular 20 percent. of each batch were undersized slaughter time.

With the more recent use of nicarbazin coccidiosis has been practically eliminated an the chickens dress out much more evenly slaughter.

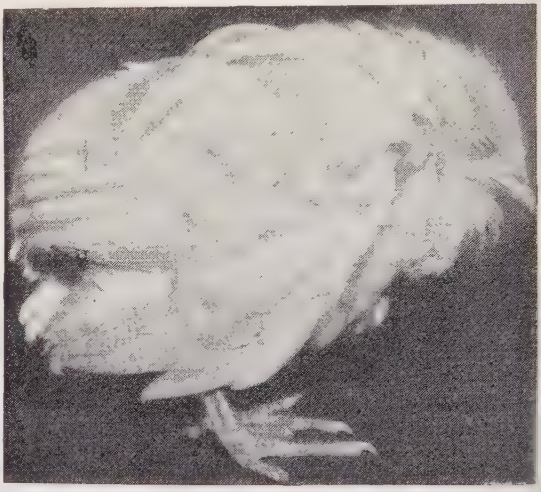

Plate 1

This Chicken was Affected by Caecal Coccidiosi Due to the Parasite *Eimeria tenella*. Note the sleepy depressed appearance and drooped wings which i typical of the disease. This form of the disease i associated with the passing of bloody droppings an deaths.

The effectiveness of the new drugs has alrea started a trend back to rearing table chicke on the ground. With the market expanding, further shift in management method can expected. Roundworm infestation could troublesome in chickens reared on the groun especially if the same litter is used for more th one batch, but effective drugs are available f this parasite.

Some Caution Required

One should be cautious in placing comple reliance on the newer drugs for table chicken Do not expect these drugs to always "mask" po sbandry practices. The coccidia may "break rough" the drug barrier under the following nditions:—

(1) Intercurrent diseases (more than one disease at the one time).

(2) Poor litter management.

Intercurrent Diseases.—When table chickens affected by chronic respiratory disease .R.D.) or chick nephritis (uraemia), their petite may be greatly reduced. Hence their ake of medicated mash may be decreased to els insufficient to prevent the coccidia develop- g. It is likely that debilitated birds eat more the litter material than healthy birds and hence ore coccidial oocysts from the litter. A oderate attack of intestinal and duodenal ccidiosis in a proportion of the birds has been served in the Brisbane area under these condi- ns where flock appetite was impaired.

Where intercurrent diseases occur that reduce e food intake of the birds, it would be wise to pply the drug in the drinking water.

Poor Little Management.—Dry litter consider- ly reduces the life of coccidial oocysts on the ound. The litter should be 6 to 8 in. deep for ickens over one month old. If it is stirred casionally, oocysts are dispersed through it.

Where chickens are overcrowded and the litter is not stirred periodically, packing and hardening of the surface layer will occur. Wet droppings from the birds then collect on the surface, offering ideal conditions for a coccidial build-up.

Even under insanitary conditions, the two main pathogenic types of coccidia (E. *tenella* and E. *necatrix*) may be still fairly well checked by nicarbazine and only occasional mild outbreaks occur. However, duodenal coccidiosis (E. *acervulina*) has proved to be a problem on several chicken farms near Brisbane, despite the use of medicated mash containing nicarbazine. However, in these cases, poor litter management and overcrowding appeared to be contributing factors. It may be recalled that this form of coccidiosis is relatively resistant to nicarbazine (and nitrofurazone) experimentally. Where duodenal coccidiosis is a problem, other drugs may need to be used.

The newer drug zoalene requires further evaluation as a preventive. For example, its action against E. *acervulina* of duodenal coccidiosis warrants investigation. The situation is even approaching where we may need to know coccidiosis in terms of coccidial species when advising on these problems.

Chicken rearing for table purposes usually involves greater intensiveness and population stress, and it is not surprising therefore that special problems may arise as a result.

Special Meat Chickens

Much has been published recently about the ecial meat chickens being bred in the Southern ates. Some Queensland hatcherymen have been ick to realise that unless the same is done in is State many of the chicken orders will go to uthern hatcheries. At least five Queensland eeders have already commenced on breeding ogrammes to produce special meat chickens.

However, it takes time to establish a new eed.

These special meat chickens will be bred to ow quickly, and they will have plumper breasts an the birds available at present. They should much more attractive to the housewife and uld result in an increased demand for table ultry.

It is fortunate that the breeding of meat chickens is more simple than breeding birds for egg production. In breeding for egg production, only one generation can be reared and tested in a year. With broilers, two generations can be reared and tested in about 14 months. This helps to give more rapid progress. So the broiler grower can expect to see some new breeds on the market within the next few years. These birds will be especially suited to his market, and it is not too far fetched to imagine that within a short space of time he will be selling birds two weeks younger but as heavy as, or heavier than, his birds at present.

—B. W. MOFFATT, Poultry Adviser.

Brucellosis-Tested Swine Herds

(As at 1st August, 1960)

Berkshire

Bernoth, B., Wyreema
Clarke, E. J., Mt. Alford, via Boonah
Cochrane, S., "Stanroy", Felton
Cook, F. R. J., Middle Creek, Pomona
Crawley, R. A., Rockthorpe, Linthorpe
Edwards, C. E., "Spring Valley" Stud, Kingaroy
Farm Home For Boys, Westbrook
Fletcher, A. C., "Myola" Stud, Jimbour
French, A., "Wilson Park", Pittsworth
H. M. State Farm, Numinbah
H. M. State Farm, "Palen" Stud, Palen Creek
Handley, J. L., "Meadow Vale", Lockyer
Handley, G. R. "Lochlyn" Stud, Lockyer
James, I. M. (Mrs.), "Kenmore" Stud, Cambooya
Kath, E. E., "Topcamp", via Toowoomba
Kimber, E. R., Block 11, Mundubbera
Law, D. T., "Rossvill" Stud, Aspley
Lees, J. C., "Bridge View" Stud, Yandina
Ludwig & Sons, A. R., "Beau View" Stud, Beaudesert
O'Brien & Hichey, J., "Kildurham" Stud, Jandowae East
Orange, L. P., "Eula", Flagstone Creek
Pfrunder, P. L., Pozieres
Potter, A. J., Ascot, via Greenmount
"Tayfield" Stud, Taylor
Q.A.H.S. & College, Lawes
Regional Experimental Station, Hermitage
Rosenberger, N., "Nevrose", Wyreema
Rosenblatt, G., Rosevilla, Biloela
Schellback, B. A., "Redvilla" Stud, Kingaroy
Smyth, E. F., "Grandmere" Stud, Manyung, Murgon
Stark, H. L., "Florida" Stud, Kalbar
Thomas & Sons, F., "Rosevale" Stud, Laravale
Traves, G., "Wynwood" Stud, Oakey
Weier, V. F., "La Crescent", Clifton
Wolski, A., "Carramana", Warra
Young (Jnr.), W., Kybong, via Gympie

Large White

Assenbruck, C., Mundubbera
Barron Bros., "Chiltern Hill", Cooyar
Bell & Son, E. J., "Dorne", Chinchilla
Behm, A. M., "Aleun", Wondai
Bishop, C. E., Beerwah
Butcher, Dr. B. J. & Parnwell, A. J., Plunkett, via Tamborine
Clark, L. D., Greens Creek, Gympie
Coller, R. H., "Relloc", Tallegalla, via Rosewood
Duncan, C. P., "Colley", Flagstone Creek
Fowler, S., "Kenstan", Pittsworth
Franke, H. J., "Delvue" Stud, Cawdor
Garawin Stud Farm Pty. Ltd., 657 Sandgate Rd., Clayfield
Gibbons, A. E. H., Mt. Glorious
Gibson, H., "Thistleton" Stud, Maleny
H. M. State Farm, Numinbah
Hall, M., "Milena" Stud, D'Aguilar
Heading, J. A., "Highfields", Murgon
Hickson, K. L., "Warra", Calliope
Horton, C. J., "Mannuem Brae" Stud, Mannuem, Kingaroy
Hutton, G., "Grajea" Stud, Cabarlah
Jensen, S., Rosevale, via Rosewood
Jones, K. B., "Cefn" Stud, Clifton
Kahler, J. & S., "Karajoy", East Nanango
Kanowski, A., "Exton", Pechey
Kennard, R. B., "Collar" Stud, Warwick
Larsen, H. L., "Oakway" Stud, Kingaroy
Law, D. T., "Rossvill" Stud, Aspley
Lees, J. C., "Bridge View", Yandina
Lobegeiger, L. C., "Bremer Valley" Stud, Moorang, via Rosewo
Mack, A. J., Mundubbera
"Marcliff", Wecker Rd., Mt. Gravatt
Neilsen, L. R., "Sunny Hill," Ascot, via Greenmount
Neilsen, A. R., Ascot, via Greenmount
Palmer, V. P. & Son, "Remlap", Greenmount
Pampling, G., Watch Box Rd., Goomeri
Port Curtis Co-operative Dairy Association Ltd., Stud Pigge
Biloela
Postle, R., "Yaralla" Stud, Pittsworth
Powell, R. S., "Kybong", Gympie
Q.A.H.S. & College, Lawes
Radel, V. V., Coalstoun Lakes
Radel, R. M., Coalstoun Lakes
Regional Experimental Station, Biloela
Robinson, O. R. & O. J., "Linvale", Argoon, Biloela
Rosenblatt, G., Rosevilla, Biloela
Skyring, G. I., "Bellwood" Stud, via Goomeri
Stanton, H. R., "Lanherne" Stud, Tansey, via Goomeri
Stehn, L. W., "Hodgson Vale", via Toowoomba
Stewart, L., Mulgowie, via Laidley
Stumer, K. F., French's Creek, Boonah
Wharton, C. A., "Central Burnett" Stud, Gayndah
Wieland, L. C. & E., Lower Cressbrook, Toogoolawah
Zahnow, W., Rosevale, via Rosewood

Tamworth

Armstrong, H. J., "Alhambra", Crownthorpe, Murgon
Booth, J. D., Swan Creek, Warwick
Campbell, P. V., "Lawnhill" Stud, Lamington
Coller, R. H., "Relloc", Tallegalla, via Rosewood
Fletcher, A. C., "Myola" Stud, Jimbour
Herbst, L., "Hillbanside", Bahr Scrub, Beenleigh
Kanowski, S. E., "Miecho", Pinelands
Potter, N. R., "Actonvale" Stud, Wellcamp
Regional Experimental Station, Kairi
Salvation Army Training Home For Boys, "Canaan" St
Riverview
Skerman, D. F. L., "Waverley", Kaimkillenbun
Stephen, T., "Withcott" Stud, Helidon
Thomas & Sons, F., "Rosevale" Stud, Laravale
Wieland, L. C. & E., Lower Cressbrook, Toogoolawah

Wessex Saddleback

Ashwell, J., "Green Hill", Felton South
Cooper, G. J., Neumgua
Douglas, W., "Greylight" Stud, Goombungee
Dunlop, J. B., "Kunawyn", Acacia Rd., Kuraby
Kingsford, D., "San Antone", Toowoomba
Kruger & Sons, "Greyhurst" Stud, Goombungee
Law, D. E., "Homevale", Goombungie
Law, D. T., "Rossvill" Stud, Aspley
Mack, A. J., Mundubbera
Scott, A., Wanstead Stud, Grantham
Smith, C. R., "Belton Park", Nara
"Wattledale" Stud, 432 Beenleigh Rd., Sunnybank

Landrace

Ashwell, J., "Greenhill", Felton South
Behm, A. M., "Aleun", Wondai
Crawford, G. L., "Glenvillan", Manneum
Crothers, B. M., "Booligar", Clifton
Duncan, C. P., "Colley", Flagstone Creek
Fowler, K. P., "Northlea", Coalstoun Lakes
Grayson, D. G., Killarney
Itzstein, R. A., "Hyde Park", Gooroolba
Jensen, A. P., & Grace, V. S., Theodore
Kath, E. E., "Topcamp", via Toowoomba
Kingsford, D., "San Antone", Toowoomba
Law, D. J., Rossville Stud, Aspley
Lush, P. B. I., Westbrook
Neilsen, A. R., Ascot, via Greenmount
Neilsen, L. R., "Sunny Hill", Ascot, via Greenmount
Orange, L. P., "Eula", Flagstone Creek
Semgreen, A. L. & D. T., "Tecona", Kingaroy
Stehn, L. W., "Hodgson Vale", via Toowoomba
Stummer, K. F., French's Creek, Boonah

Large Black

Pointon, E., Goomburra

Iow Far Does he Egg Spread Vhen Broken Out?

y *B. W. MOFFATT, Poultry Adviser.*

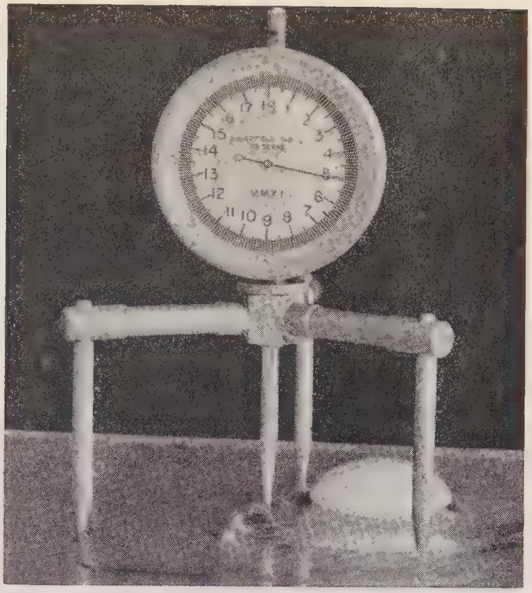

Plate 1

This Micrometer, Graduated in 0.1 mm, is Used to Measure the Height of Thick White in an Egg.

The housewife judges the quality of an egg largely by the amount of thick white in the egg, or, in other words, how far the egg spreads when broken out.

Much work will be done in Australia in the xt few years to try to improve the quality eggs being marketed. New handling and arketing methods will be tested and eventually e poultry breeder who is breeding for better g quality may be involved.

For this type of work an accurate method of aluating egg quality must be available. method which involves opinions is of little e because different operators will have varying inions. Fortunately a number of reasonably curate methods of determining egg quality have en developed in other countries.

One of these methods has been in use in Queensland since early 1959 and has proved very effective. It is called the Haugh Unit Method, being named after the American refrigeration engineer who formulated it. The theory behind it is somewhat complex but it is an easy method to use.

In America it is considered one of the most useful ways of evaluating egg quality because it gives a close approximation of what a housewife sees in an egg. The housewife judges an egg largely by the amount of thick white in the

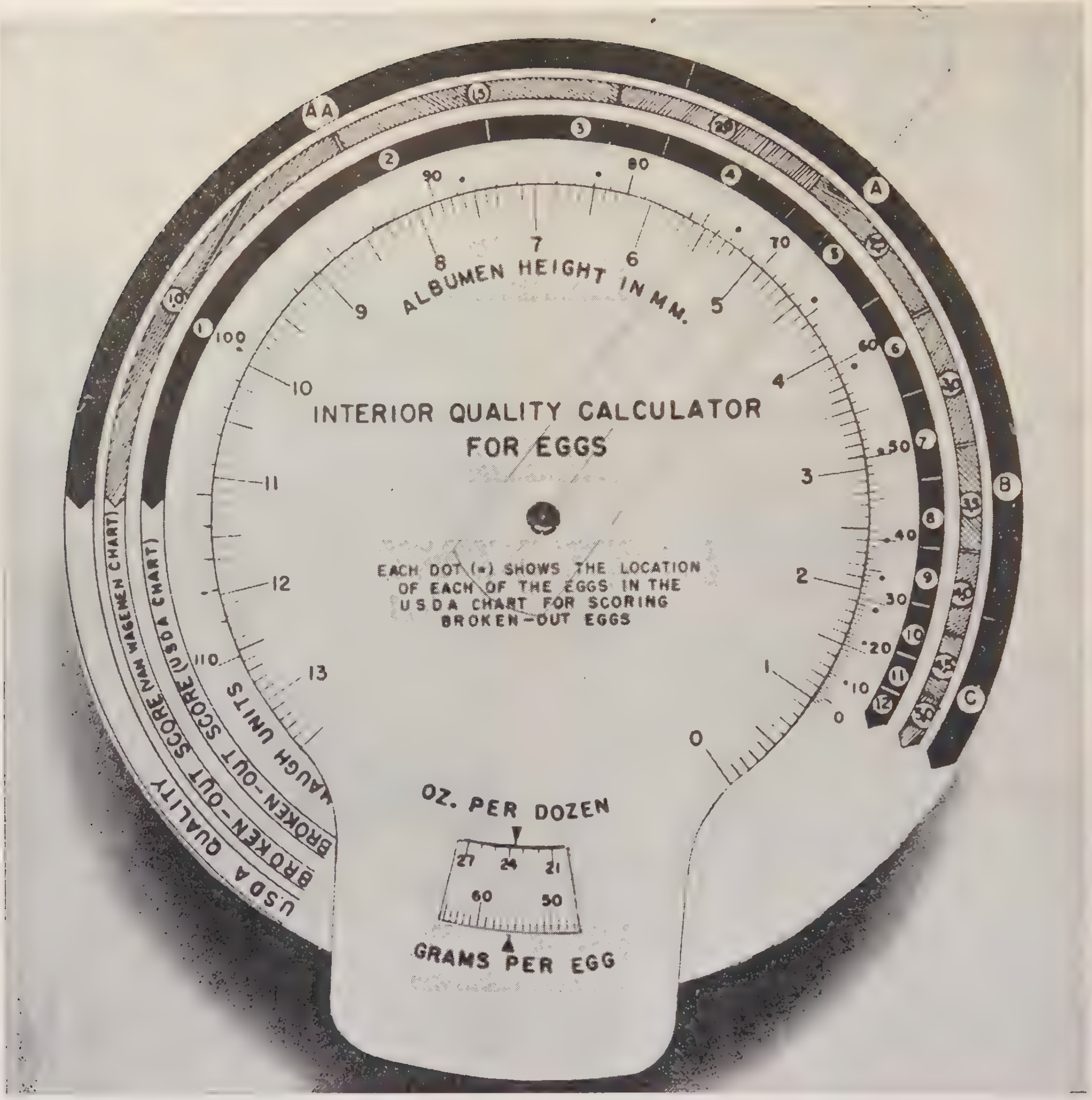
INTERIOR QUALITY CALCULATOR
FOR EGGS
ALBUMEN HEIGHT IN MM.
EACH DOT (•) SHOWS THE LOCATION
OF EACH OF THE EGGS IN THE
U.S.D.A CHART FOR SCORING
BROKEN-OUT EGGS
HAUGH UNITS
BROKEN-OUT SCORE (U.S.D.A CHART)
BROKEN-OUT SCORE (VAN WAGENEN CHART)
U.S.D.A QUALITY
AA
A
B
C
OZ. PER DOZEN
27
24
21
60
50
GRAMS PER EGG

Plate 2

The Interior Quality Calculator Indicates the Quality of an Egg in Haugh Units. The egg in Plate 1 weighed 56 grams (2 oz.) and had a thick white height of 5.1 mm. Its Haugh Unit value is shown as 71.5 units. This is a first quality egg.

egg, or, in other words, how far the egg spreads when broken out.

How to Measure Quality

Haugh units are a measure of the thick white in an egg, related to the size of the egg. When the egg is first laid, it contains a large amou of thick white and, as it ages, this thick whi breaks down to watery thin white. Naturall there is more thick white in a large egg so th size of egg must be taken into consideration.

Thus the first step in measuring Haugh Units to weigh the egg in grams (28 grams=1 oz. proximately).

The egg is then broken out onto a level eet of glass. A micrometer (see Plate 1) used to measure the height of thick white. ne micrometer measures in millimetres with n accuracy of 0.1 mm (25 mm=1 in.). The easurement is usually taken on a flat area of e thick white halfway between the yolk and e edge of the thick white. In a very fresh g there is no flat area but the reading is ade at the same place. Thus we have the eight of the egg in grams and the height of e thick white in millimetres. These figures e then entered on a calculator (see Plate 2) nd the value of the egg's quality in Haugh Units n be obtained.

The Haugh Unit value can range from 1 for very stale egg to 110 for a very fresh egg.

This calculator also indicates the grade of the g by United States Department of Agriculture ade standards. An egg 79 units and above AA quality, 55 to 78, A quality, 31 to 54, quality and below 31 C quality. In Queensland st quality would include eggs above 55 units nd second quality eggs below 55 units.

It is quite obvious that this method of testing g quality does not involve opinions and can ve a fairly accurate evaluation. It is very eful where small differences in quality are to detected.

eeding for Improved Quality

In some overseas countries this method of aluating egg quality is used in improving egg ality by breeding.

It is an established fact that interior egg quality can be improved by breeding. A few eggs from each hen being tested are broken out and their quality measured in Haugh Units. It is usually found that a hen lays an egg of a certain value so that if three eggs are measured the readings in Haugh Units will be very close. Each bird is therefore given an average score and the birds with the highest scores are used for breeding. In this way egg quality gradually improves.

At the present time it is doubtful if this amount of work is warranted under Queensland conditions. However, in the near future it may prove worthwhile. At least one breeder in the Queensland Poultry Improvement Plan is expected to undertake this work in a small way in the very near future.

Its Use in Market Surveys

Most manufacturers have a quality control staff on their payroll. Their job is to check the quality of goods being sold by testing a sample of goods from each batch. If quality falls below a certain standard they notify the production line so that steps can be taken to correct any faults. A similar procedure could apply to the marketing of eggs. The Haugh Unit method would be useful in evaluating egg quality at wholesale (the marketing authority) and retail (the shops) points and if faults are found then these can be traced back in the production line. In this way the poultry industry would be assured that its product reached the market with a guaranteed quality. This could prove a big incentive to the housewife to buy more eggs. She could buy with confidence.

Principles and Methods of Animal Breeding, by R. B. Kelly.

Published by Angus and Robertson, of Sydney, in eir Agricultural and Livestock Series, this book is now its third edition. The first edition was published in 46 so that the book has been before the public for years, an indication of its general acceptance. iginally written with the interests of breeds of liveck in mind, subsequent additions have taken into count the needs of students of animal genetics. In dition to covering principles of breeding and evolution the book deals with phenotypic and genotypic selection at some length and in the course of three chapters on modern animal breeding with such topics as artificial insemination, family selection, heterosis, bull proving, progeny testing and selection indices. With it all the book recounts the methods used by outstanding breeders of the past. For the student especially, the appendices on coefficients of inbreeding and relationship and on biometrics will be found useful. There is a worthwhile six-page glossary of technical terms used in animal breeding and an eight-page index, the number of pages in the book as a whole being 358. The price is 48s.

Cotton Growing In Queensland—2

By Officers of Agriculture Branch.

Cultivation of the Crop

The yield and quality of the seed cotton produced are dependent largely on the efficiency of cultivation, especially during early growth. Good clean fields are also highly desirable if crops are to be picked mechanically. Because mechanical pickers offer an opportunity for sound development of the cotton growing industry in Queensland, growers should ensure the efficient and trouble-free operation of these machines. Weed-free fields are an important factor.

If the first cultivation is delayed until the plants are 4 to 5 in. high, considerable development of pigweeds and summer grasses may occur, especially when early showers are experienced. It then becomes very difficult to destroy this growth without hand labour, even with the most efficient cultivators. This not only increases the cost of production but depletes soil moisture which otherwise would be available for the growth of the crop. Furthermore, certain important cotton pests may commence their attacks from weeds.

It is a good practice to harrow after the rain before planting, and cultivate close to the row as soon as the seedlings are 2 to 3 in. high, using a cultivator equipped with tines 2¼ in. wide and guards to prevent the soil covering the plants. This eradicates weed and grass seedlings, establishes a nice mulch around the plants, and helps to prevent any further growth of weeds in the row.

Discs should not be used, as they have to be set to cut the soil away from the young plants. This would leave the plants on a narrow ridge, the sides of which would be so exposed that th soil would set hard enough to restrict growth To overcome this, another cultivation would hav to be made soon after, with the discs reverse to throw the soil back to the plants.

If rain falls before thinning time, it will b necessary to cultivate again, especially on ol cultivations; otherwise this will not be necessar until the thinning is done. A careful cultivatio is given after thinning to re-establish the mulc between the rows and around the plants, and th should be done as soon as possible.

If the cotton plants are from 3 to 5 in. hig when a second cultivation is required, thinnin can be achieved very cheaply and efficiently b harrowing across the rows with a spike-too harrow or tine cultivator. Before doing thi make sure that the stand of cotton plants is goo and that the field is fairly level and free of tras such as large pieces of grass, cotton roots an sticks.

If cotton is grown in rotation with grass, n more than three or four cultivations should b required after the one immediately following th thinning. More may be required on old cultiva tions. At each of these operations, the soil shou be worked to the plants. Not only does th help to control weed and grass growth but firm brace is established around the plants whic assists in preventing them from being blown ove during severe storms.

Where the rows are planted on the leve contour across the slope, this firm bracing soil around the plants will also assist in retardin the run-off of storm-water.

Plate 5

High-Clearance Scarifier Suitable for Late Cultivation.

It is an advantage with mechanical picking to ave the plants lightly hilled up.

A high degree of efficiency should be aimed t in the cultivation operations. Most farms are ow equipped with light, high-speed tractors fitted ith their own particular cultivating equipment. his equipment allows quick coverage of the rops and if properly used can hold the weeds in heck satisfactorily. Weeds allowed to get out f control, however, force the grower to use edious and expensive hand-hoeing to save the rop.

It is advisable to continue cultivation as late s possible, so as to allow maximum penetration f storm rains (Plate 5). If the last cultivation is made when the surface soil is dry and crusted enough to break up into clods, it will be all the better for retarding the run-off of storm rains.

Tractor equipment can give excellent results if properly used. In endeavouring to cultivate a large daily acreage, the tractor is frequently driven so fast that the cultivating attachments push the loose soil aside excessively. Then they have to be set well away from the row to avoid the covering of small cotton plants. Such setting does not facilitate the destruction of weed and grass seedlings close to the plants. Tractors, therefore, should be equipped with suitable guards when cultivating small cotton plants. This will prevent the soil covering the seedlings and efficient work can be done.

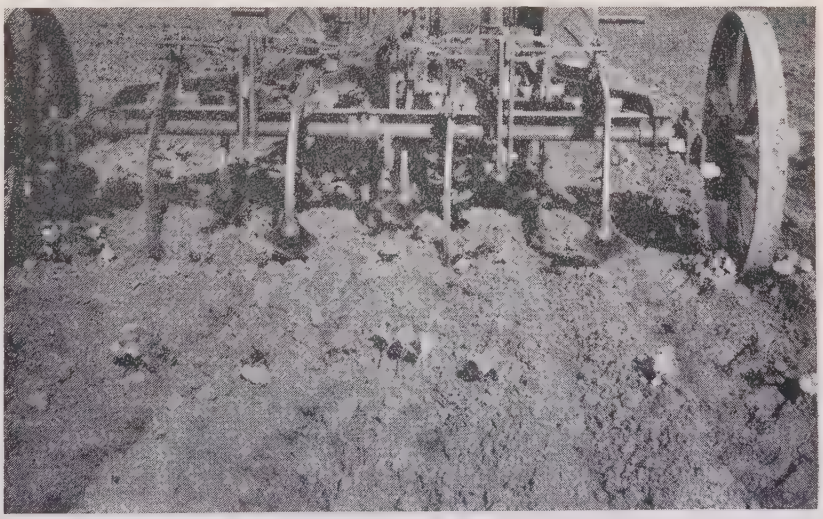

Plate 6

hinning With a Cultivator.

he tines are spaced according to the stand of seedlings.

Trials with pre-emergence weedicides have, at the time of writing, not been successful in Queensland.

Thinning

The shortage and cost of rural labour has resulted in some changes in the methods of thinning cotton. In order to reduce the costs, cross-cultivation is recommended. Where sufficient seed has been used to give a thick stand of seedlings, and where the surface of the field is relatively free from trash, cross-harrowing when the plants are about 4 in. high with a spike-tooth harrow or tine cultivator (Plate 6) is advisable. This will eliminate many of the seedlings without adversely affecting the stand.

Plate 7

Pre-planting Irrigation in the St. George District.

In addition to thinning the seedlings, cross-harrowing reduces weed growth adjacent to the plants much more than inter-row cultivation. If the original stand is good, two or even three such harrowings can be made before the plants are 5 in. high. The aim is to leave a spacing of 1 or 2 plants per foot of row.

It is important that the desired spacing rate be attained before the plants become too far advanced because, with the light rains that are often experienced in the spring, competition for moisture becomes acute in unthinned cotton. On the other hand, for various reasons, terminal of the cotton seedlings may become deformed early in their growth. Hence growers are loth to thin too early, especially in seasons when cutworms are present in large numbers, for fear of losing their stand of well-formed plants after thinning.

However, if left until the plants have developed a firm hold in the ground, thinning by cross-cultivation is almost impossible. This is because the tines of the implements tend to slide off the firmly rooted plants unless a sharp cutting edge is maintained. Even with such an edge many seedlings will be only partially removed and, as a consequence, there will be a very considerable proportion of mutilated plants in the stand capable of making, at best, only a ragged uneven growth.

Under these circumstances, hand chopping must be resorted to. For this purpose a light type of goose-neck garden hoe should be used instead of the heavy chipping hoe. Not only can the strokes be guided more accurately when using the lighter hoe but they can be made with much less fatigue, resulting in a greater daily acreage of chipping, as hand thinning by hoe is often called.

rigation

Most cotton crops in Queensland are rain-rown, but an increasing acreage is being prouced with supplementary irrigation. Considerble local experience indicates that a large area f cotton could be profitably grown with suplementary irrigation.

Cotton is very suitable as a pioneer crop on a ewly established irrigation area. It requires a ood supply of subsoil moisture at planting time, nd a pre-planting irrigation of 3 or 4 in. is dvisable when subsoil moisture is depleted Plate 7).

Planting usually follows this initial irrigation, nd no further watering is required until the lants square or produce flower buds about six eeks later. Excessive moisture during the preuiting period tends to stimulate vegetable rowth and delays crop formation. Deferring rigation restricts early vegetative growth and auses the development of a small, well-structured lant which makes an early crop of bolls.

After crop formation has commenced, irrigaons should be timed to prevent the checking of rowth and loss of crop from shedding.

Borings will give an indication of the reserve f soil moisture in the soil, but the cotton plant self shows easily recognisable symptoms of low oil moisture. As the supply of available soil oisture becomes depleted the leaves darken in olour and begin to droop and wilt. Flowering ccurs towards the tops of the plants and the eddish colour, which is normal on the older oody portions of the stalks, approaches and may ven reach the terminal buds.

Irrigation should be applied when the flowers nd reddish stem colour are about 9 or 10 in. rom the tops of the plants, otherwise cessation f plant growth and loss of crop will occur. Application of water when the terminal shoots of he cotton plants are soft and sappy will induce ank plant growth, as plants in this condition ndicate ample available soil water.

The quantity of water required at each irrigaion is governed largely by the soil type, but the im should be to replenish soil moisture to a epth of 2 ft. This usually necessitates a 3-in. pplication. Irrigation is influenced by rainfall, ut often two or three irrigations are necessary n addition to the pre-planting irrigation.

The critical period in the main cotton-growing areas is during the summer heat waves, when early planted crops are fruiting heavily. Stress conditions on many soil types can occur quickly under these conditions, and the need for timely irrigations should be anticipated so that the whole area can be irrigated before shedding occurs.

Cotton is mainly furrow irrigated, but sprays are used for areas where the soil type and topography are not suitable for the furrow method.

Experiments with furrow versus sprays show that where land is graded to give a uniform flow of water, yields are similar with both methods. In the case of very sandy soils, however, spray irrigation gives a better distribution of water. On the other hand, less labour is required for furrow irrigation, as no changing of spray lines is necessary.

Queensland experiments with irrigated versus non-irrigated cotton have demonstrated the soundness of growing cotton with supplementary irrigation during years of irregular rainfall. Only in two seasons out of 12, when the seasonal rainfall was higher than average, and soil moisture was adequate for crop production, did rain-grown cotton outyield irrigated cotton. The overall average for all seasons was 1,478 lb. of seed cotton on the irrigated areas as against 757 lb. on the non-irrigated areas.

Harvesting Cotton

The harvesting of cotton is the most expensive item in the production of this crop, and the degree of efficiency displayed in picking, packing and forwarding the cotton has a decided effect on the quality of the lint produced.

When to Pick. One of the most important points to observe is that cotton should not be picked either when it is wet from exposure to rain or when it is green (Plate 9). Cotton is green until the bolls have been open long enough to allow the fibres to dry out thoroughly. Not only is it difficult to clean leaf and trash out of cotton in either condition, but during the ginning operations the saws cut the wet fibres very badly, and also tend to leave them in a twisted, ropy state. Lint of this nature is easily detected, and the buyers penalise it heavily, for much waste comes from such cotton during the spinning operations.

Hand picking may be done while the dew is still present, but the cotton should be spread out in the sun to dry during the morning, after which it can be baled with the rest of the day's picking. It is not necessary to dry the cotton which is picked after the dew is off, provided green cotton is not included.

Another important point when harvesting cotton is to guard against leaving the cotton exposed too long to the weather (Plate 10). When the bolls first open, cotton has a richness of colour, or bloom, as it is termed. Cotton without this bloom will not be placed in the higher grades of the regular universal standards, although it may, in other respects, be of good quality. When cotton is left unpicked for several weeks, the bloom is lost through the bleaching action brought about by repeated wetting with dew and subsequent drying by the sun.

The affect of adverse weather on cotton ready or nearly ready for picking is worse than that of dew. Its colour is changed to a dull, greyish tinge, and even to a light-bluish tinge when rain lasts several days. When rain occurs cotton should not be picked until there have been several days of sunshine to assist in bleaching out the stains, and to enable the breeze and the heat to fluff out the fibres. This greatly improves the appearance of the lint, and raises both the lint and seed cotton by at least a half-grade. The delaying of picking after a storm until the cotton has improved in appearance means firstly that the cotton is of greater value, and secondly that picking costs are not inflated by moisture in the weight tallies.

Plate 8

Fully Opened Bolls Containing Locks of Mature Cotton Suitable for Harvesting and Ginning.

The picking of cotton should not be delayed too long, as strong winds may cause considerable deterioration in its quality. With the continuous movement of the plants in windy weather, the locks tend to hang out of the bolls in a long, stringy condition. This not only allows the cotton to dry out excessively, thus losing weight and adversely affecting the character of the fibres, but also makes the seed cotton difficult to gin properly.

This is due to a considerable proportion of the locks being in a twisted, rope-like condition which gathers up pieces of broken bracts and leaves in windy weather, especially if severe frosts have occurred. It is difficult to clean such trash in the ginneries, for the smaller pieces are generally twisted in amongst the fibres.

In addition to these disadvantages, much greater loss on to the ground occurs in wind-blown cotton during heavy storms than when picking is done at proper intervals.

Where the harvesting is done by hand by the grower and his family, it will pay to make several pickings in a good crop, the number depending on the season. Where labour is employed it has to be remembered that sufficient bolls must be open to allow the picker to make a reasonable tally. It has been found satisfactory to make one good picking and then a clean-up in fields of light to medium yield, and two pickings and a clean-up in good crops.

Hand Picking. Picking is done by using both hands working independently of each other, but guided by the eye in each case. This enables the picker to fill both hands before emptying their contents into the sack and saves many movements during the day. Generally a sack is strapped around the waist so that the bottom rests on the ground and the mouth is open, thus enabling the cotton to be put in quickly.

With the cleaning machinery installed at the ginneries it is not necessary to pick only clean cotton. A certain amount of the bracts, the leaf like parts surrounding the boll, may be included provided they are not in twisted cotton. These bracts are removed in the cleaning machinery before the cotton is ginned.

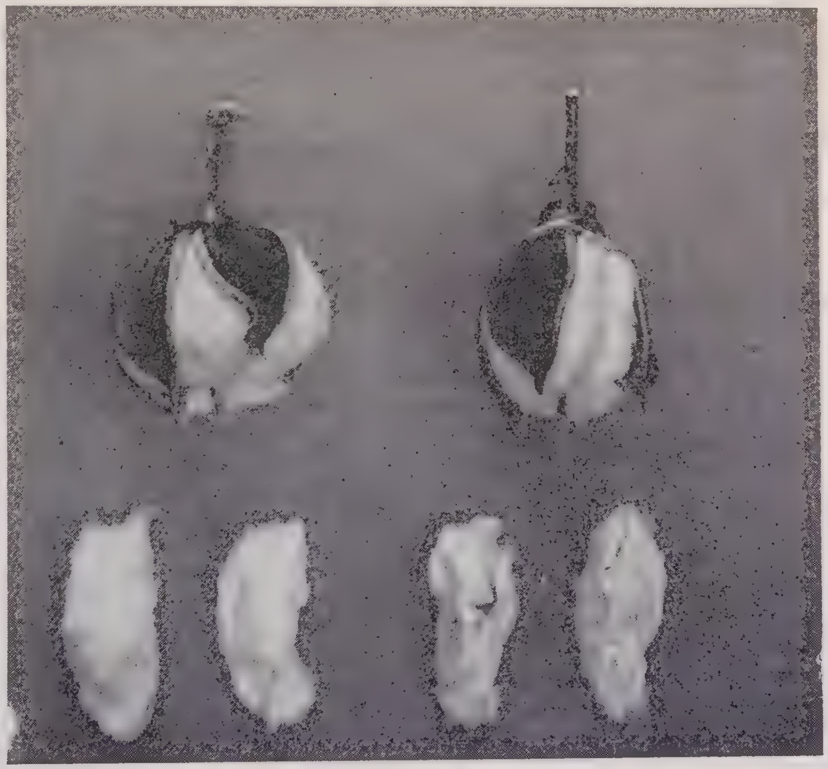

Plate 9

Green Cotton. The four locks in the lower row are comparable with the locks in the two partly opened bolls. Their fibres are wet and matted together, giving them a shiny, satiny appearance. Such green cotton cannot be ginned satisfactorily. If left to open fully, however, these bolls would contain fibre similar to that shown in Plate 8.

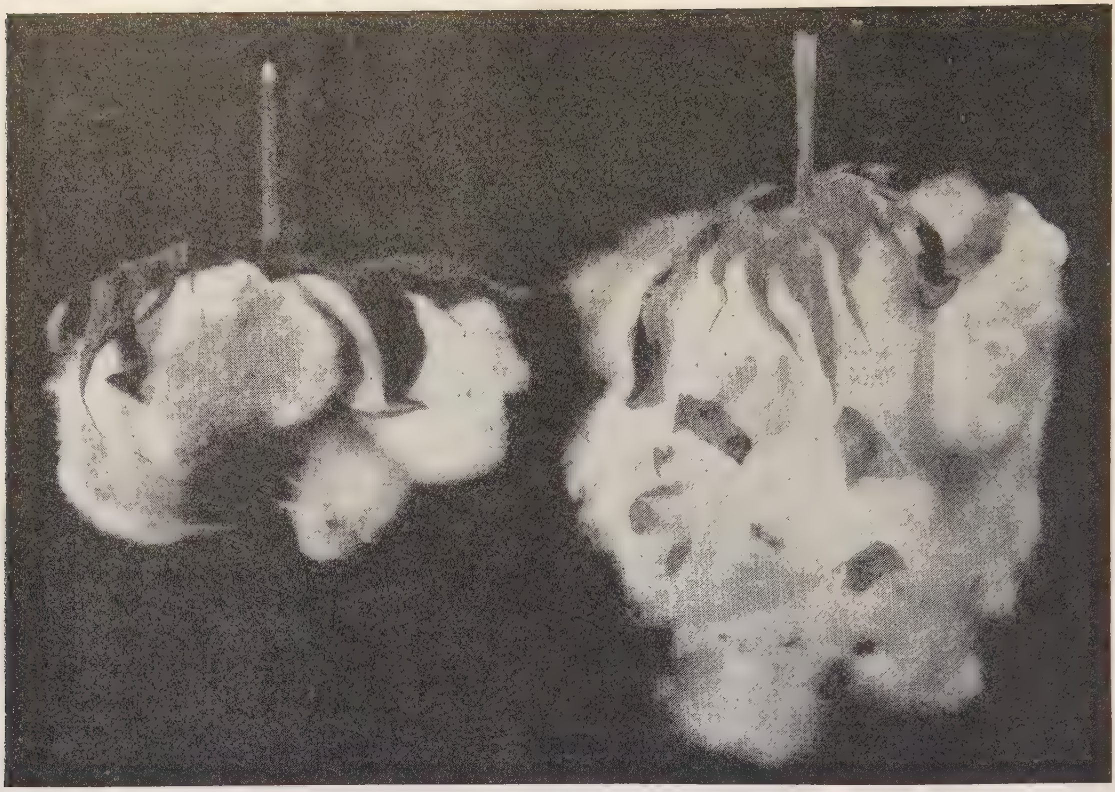

Plate 10

Boll on Right Shows Cotton that Has Been Left Unharvested Too Long. Boll on Left is Unsuitable for Harvest. Note dark surface centre lock.

The amount of stained cotton should be kept to a minimum, however, for the stained fibres are soft and weak and are cut up in the ginning. Their colour lowers the value of the rest of the lint.

Hard and diseased locks should not be included, for these lower the grade of the cotton.

The most difficult matter to remove from the cotton lint is grass and weed seed, especially spear grass seed, and every effort should be made to clean the fields at the last cultivation so that no grass or weed seed will be produced. On old cultivations, even where good farming practices have been followed, there is always a danger of tall-growing weeds in the rows setting seed late in the season, and it pays to chop out such weeds before harvesting commences, especially if mechanical pickers are employed.

Mechanical Picking. Several types of mechanical pickers have been developed but the only ones in operation in Queensland belong to the spindle type (Plate 11). This type is designed to pick cotton from the open bolls by means of spindles, fingers or prongs, and to do this at any time during the harvesting season, without damaging unopened bolls or branches.

About half the machines at present in this State are owned and operated by the Cotton Marketing Board, to whom requests for their use should be directed. The number privately owned is increasing and most owners will carry out some contract picking.

All the precautions necessary to obtain the highest quality seed cotton should be adhered to when these machines are used. Seed cotton should not be left too long in the field but should be harvested as soon as there is sufficient crop open to warrant the use of the mechanical picker, a yield of approximately 500 lb. of seed cotton to the acre or more being satisfactory for machine operation.

Under Queensland conditions a mechanical picker averages 500 lb. of seed cotton an hour, but the rate varies according to the amount of seed cotton open. Since the speed of the machine is constant, and the picking percentage is also somewhat constant, the cotton picked in a given time will be proportional to the amount of open cotton on the plants. Therefore the machine operates with maximum economy in high-yielding crops.

Rankly grown cotton plants are undesirable for mechanical picking because the development of a large number of branches on them prevents the spindles engaging the open bolls of seed cotton as they pass through the plants. Where heavy plant growth does occur it may be necessary to repick the rows, working in the opposite direction.

For the successful operation of a mechanical picker, close attention must be given to cultural practices so that at harvesting time the field is as free as practicable of weeds, grasses, sticks, stones and rubbish. The presence of sticks, stones and rubbish can be instrumental in causing long delays as well as possible serious damage to the machine.

The use of defoliants for reducing the amount of leaf on the plant and therefore the trash in mechanically-picked cotton is receiving attention. Experiments are being conducted to examine the economics of this practice under Queensland conditions.

Hand v. *Mechanical Picking*. The saving in labour effected by mechanical pickers is a distinct advantage and their introduction is likely to have an important influence on the development of the cotton-growing industry in Queensland. Experience has shown that provided a field of cotton has received proper cultural care, is free of sticks, stones and rubbish, and the plants have grown normally, a mechanical picker will pick seed cotton satisfactorily and efficiently. Each machine can do the work of at least 20 hand pickers.

On the other hand, it is clear that, on the average, hand-picked seed cotton is usually a

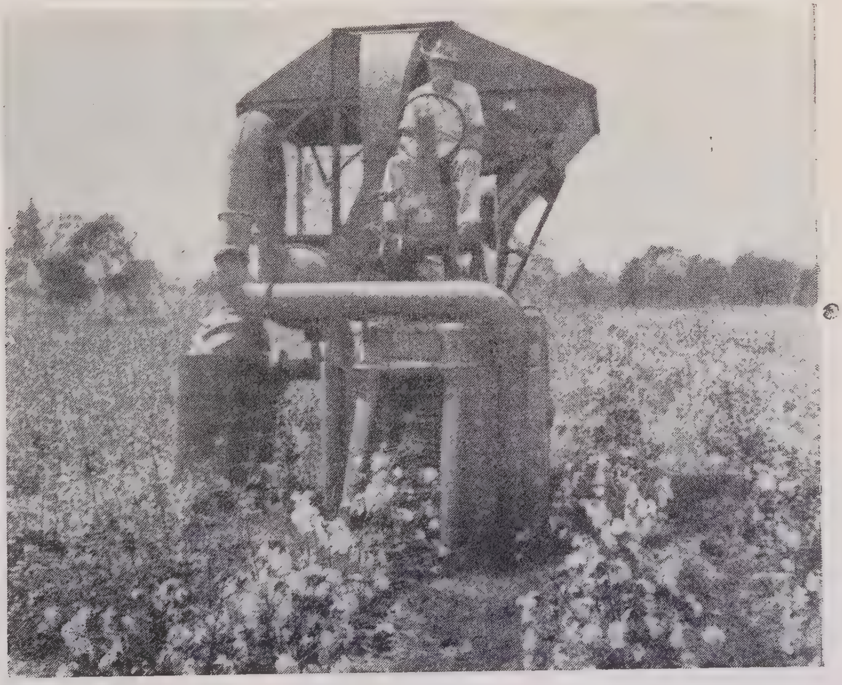

Plate 11

A Mechanical Picker Showing Cotton Plants Entering the Spindles.

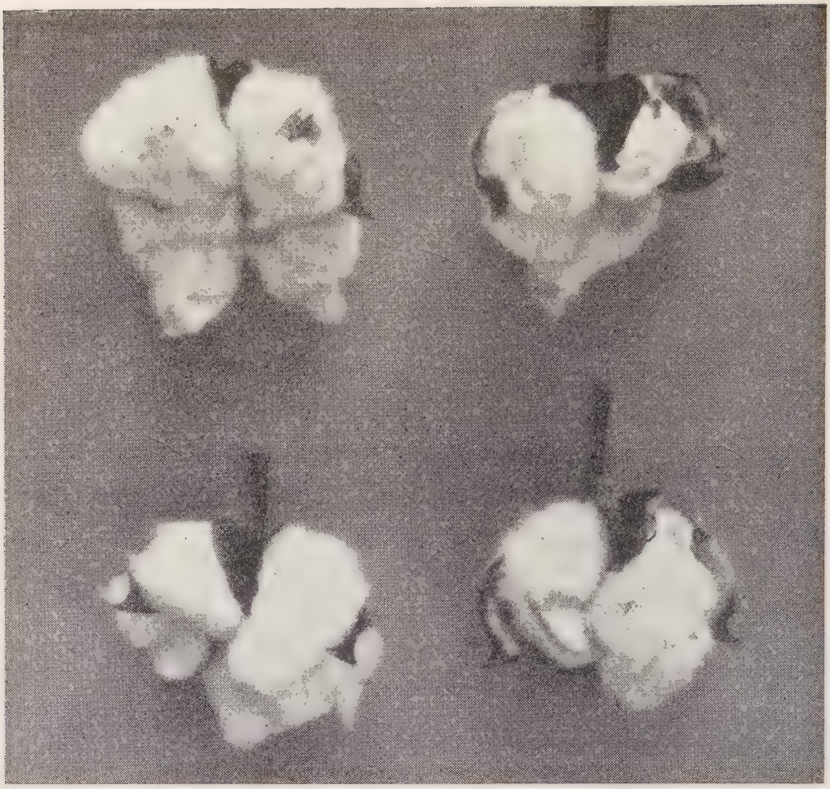

Plate 12

Upper Row: Boll on Left Suitable for Hand Picking; Boll on Right Suitable for Snapping. Lower Row: Boll on Right should not be Snapped; Boll on Left Suitable for Snapping.

grade higher than comparable mechanically-picked cotton because of the greater amount of leaf and other foreign matter in the latter.

Recent developments in lint cleaning machinery are expected to raise the grades of trashy, mechanically-picked cotton, but such machinery cannot be expected to improve the colour, strength and length of the cotton fibres.

The amount of cotton mechanically picked varies from 85 to 95 per cent. of the open crop. Tests carried out in the field during harvesting operations, however, have shown that much of the seed cotton left on the plants by the machine consists of weak immature fibre in partly diseased locks which, if picked, would lower the grade of the seed cotton harvested and so reduce its value.

Under ideal conditions, hand picking would not be a great deal more efficient than mechanical picking, but when the plants carry rank growth the performance of hand pickers may then be definitely superior.

Snapping. Cleaning machinery is installed at the Glenmore and Whinstanes ginneries for treating snapped cotton. Snapped cotton is obtained by snapping or jerking the whole bolls and their contents from the plants. It should be practised only after heavy frosts have been experienced, because, prior to such frosts, some green plant material is removed with the snapped bolls. As a consequence sweating will occur in the containers when the cotton is forwarded to the ginnery and this adversely affects cleaning and ginning.

Snapping undoubtedly lowers the grade of most of the mature cotton of high quality to the point where the full value of the lint cannot be obtained. On the other hand, snapping the top crop of bolls (Plate 12), which usually contain cotton of lower quality, not only does not lessen the value materially but makes practicable the cheap harvesting of a considerable amount of cotton which would not otherwise be picked.

Only bolls containing marketable cotton should be snapped, for dry, hard, diseased bolls contain no worthwhile cotton, and are removed in the cleaning machinery before the seed cotton is weighed. In addition, the weak and wasty fibres of partly-developed bolls are so badly gin-cut as to lower the quality of the whole bale.

Under no circumstances should wet or even damp snapped cotton be forwarded to the ginnery. Only lint of the lowest grades can be obtained from it, because the large pieces of moist bracts become so entangled in the fibre that the cleaning machinery cannot remove them.

Snapping is of value to Queensland cotton growers, but should be adopted with discrimination.

Recently, mainly as the result of the increased amount of mechanical picking, bulk handling has been introduced on a limited scale. The seed cotton is loaded direct from the machine into trucks or trailers and conveyed by road to the ginnery. This method has much to commend it but, until the ginneries convert portions of the receiving platforms and arrange extra storage bins, there is little scope for expansion of bulk handling.

One big advantage is that the cotton is not compacted as it is when packed in bales. Mechanically picked cotton invariably carries some green leaf and tight packing in the bale causes some sweating and staining of the lint. For this reason no more than 350 lb. of mechanically picked cotton should be packed in the bale. With hand picking, bales can usually carry up to 450 lb.

Plate 13

Packing Cotton in a Once-Used Woolpack.

Packing and Forwarding Cotton. Owing to the distance of the cotton fields from the ginneries in Queensland, the crop is usually forwarded by train. It is contained in either bags or woolpacks containing around 80 to 100 lb. and 350 to 450 lb. of seed cotton, respectively. The growers of small acreages generally use containers such as second-hand chaff-bags, while those with more than 5 or 6 acres generally purchase once-used woolpacks (Plate 13). It is cheaper to use woolpacks, obtainable from the Cotton Marketing Board, because they are returned to growers for a small fee, which covers cost of freight, whereas bags are not returned and thus represent a loss to the grower.

Before a container is filled, it should be cleaned carefully to remove everything that might affect the grade of the cotton. Woolpacks, especially those that have had cotton in them, should be cleaned in order to protect the purity of the seed. Growers should pay particular attention to this requirement, for contamination of pure seed varieties can be caused by admixture with seed cotton remaining in the corners of the wool packs or attached to strands of the sewings along the edges.

Cotton, on being harvested, should so far as is practicable, be packed in separate containers according to its grade and staple. Obviously inferior grades can be readily separated from higher quality material, but the objective to be aimed at is to carry the separation much farther and, in so far as is within the skill of the packer, to achieve a high degree of uniformity of grade and staple in each container.

Every grower has a registered number, and should include this with his initials and railway station in a brand for identifying each container he sends. The brand should be placed in a conspicuous part of the container. It should be in black that will not rub or wash off.

Each season a number of woolpacks are received at the ginneries which have no identification marks, or on which the brands are so indistinct as to be illegible. It is only through checking the advice notes which a grower despatches to the Board when forwarding his cotton, that the ownership can be established. This slows up the work at the ginnery, and should not occur.

Marketing

The whole of the Queensland cotton crop is handled each season through a compulsory cotton pool, which is managed by a Cotton Marketing Board composed of one elected cotton grower from each of the six districts into which the cotton areas are divided, and the Director of Marketing of the State Department of Agriculture and Stock. As soon as a grower places his cotton on rail, the pool takes possession and pays all transportation, ginning and marketing costs. The growers, through a co-operative association, own the ginneries for ginning the crop and the oil mill for treating the resultant seed, thus ensuring to them the full value of their crop.

When a consignment of cotton arrives at the ginnery it is graded and the poundage of each grade and staple length is obtained. A first advance is paid to the grower, usually about 70 per cent. of what the average basic value of the crop is estimated to be. As sufficient money accumulates from the sale of the crop, further advances on a flat rate per pound of cotton are paid to each grower until the sale of the crop is completed.

The sale of the crop in Australia is made direct to the spinners by the Board, so that no commissions are paid other than those to overseas brokers selling any portion of the crop not required in Australia. Under this system the grower is assured of his crop being ginned and marketed to his best advantage.

Time of Planting in Strawberries

It has been known for some time that plant growth and development in the strawberry are influenced by times of planting. The significance of this in commercial practice was investigated in trials between 1956-59.

In the 1958 trial, four plantings were made at fortnightly intervals between February 18 and April 22. Of these, the mid-season planting made in March proved superior to February plantings and April plantings. Total berry production for the season and the proportion of the crop harvested in June reached a maximum in the March plantings. Earlier planting tended to promote vegetative growth at the expense of fruiting, while April-established plants lacked vigour throughout the whole season.

In the following season (1959) yields were directly correlated with time of planting, maximum production being obtained from plots established in February. Plant performance declined with each two weeks' delay in the time of establishment. The discrepancy between the results in 1958 and 1959 probably reflects seasonal conditions. Both trials, however, indicate that commercial plantings should be made not later than the third week in March. Yields from April-planted crops may be 50 per cent. down.

Regardless of time of planting, the peak harvesting period (August-September) is the same. However, there is usually a second minor peak of harvesting in October. Late planted strawberries began to throw runners in November, some weeks ahead of early and mid-season plantings.

It is concluded that commercial crops should be planted during the first three weeks of March. Plantings in late February may do better or worse depending on seasonal conditions early in the growing period.

—*K. M. WARD, Senior Horticulturist.*

Beet Nematode Detected In Queensland

By R. C. COLBRAN, Entomologist.

The beet nematode, an important pest of beetroot, turnips, cabbages and related crops, has been found in Queensland. The life history, behaviour and control of this pest are discussed.

The beet nematode* was first observed in 859 on the roots of sugar beets in Germany. lthough this pest occurs elsewhere in Australia, ts presence in Queensland was not detected until ay 1960 when a heavy infestation was responible for the failure of a cabbage crop at Lawes n the Lockyer Valley. Beetroot in an adjacent rea were also infested.

ife History

Second stage larvae enter susceptible plants ear the root tips, feed on the cell contents and ass through three moults before becoming dults. During development the females break hrough the root tissues and remain attached by heir heads. After fertilization these develop into hite, lemon-shaped bodies about the size of pin eads, and are easily seen with the naked eye long the roots. Each female produces 100–600 ggs, some of which are deposited in an external elatinous matrix whilst others are retained within he body. Death of the female is accompanied y a change in the chemical composition of the ody wall turning it into a leathery and durable yst enclosing developing eggs. These eggs may emain viable for several years. Hatching is timulated by substances from roots of certain lants.

osts

Crop plants liable to damage by the beet ematode include sugar beet, beetroot, mangel-

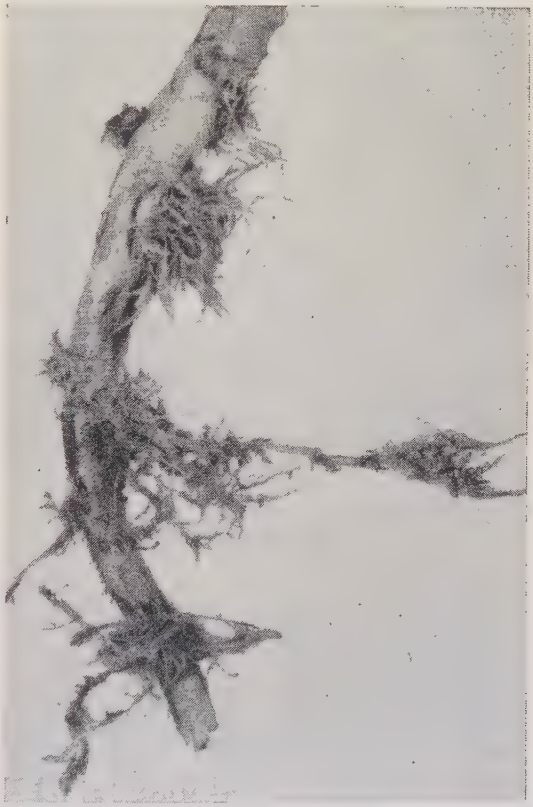

Plate 1

Cabbage Roots Infested with the Beet Nematode. Note the abnormal root system with an abundance of short fibrous (hunger) roots.

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* *Heterodera schachtii* Schmidt.

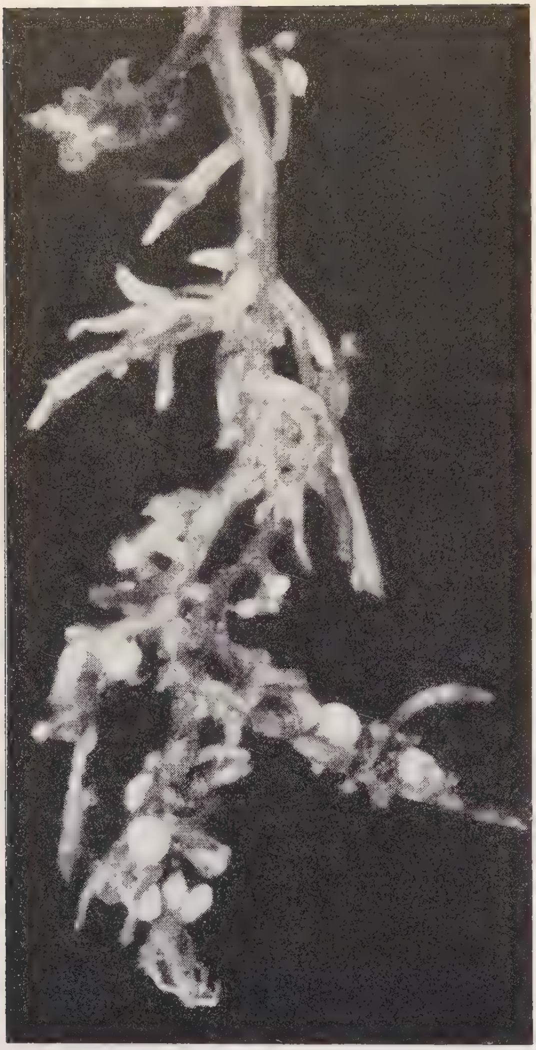

Plate 2

Cabbage Roots with White Cysts of the Beet Nematode.

wurzels, cabbages, cauliflowers, kale, broccoli, Brussels sprouts, spinach, turnips, rape, radishes and rhubarb.

Weeds reported as hosts include fat hen (*Chenopodium album* L.), shepherd's purse (*Capsella bursa-pastoris* (L.) Medic.), hedge mustard (*Sisymbrium officinale* (L.) Scop.), wild radish (*Raphanus raphanistrum* L.), curled dock (*Rumex crispus* L.), chickweed (*Stellaria media* (L.) Vill.) and pigweed (*Portulaca oleracea* L.).

Plant Symptoms

The appearance of areas where plants are undersized is usually the first evidence of nematode injury. Under continuous cropping with susceptible hosts, these areas increase in size.

Heavily infested plants are small and stunted. **The roots are not galled** but there is an abundance of fine rootlets, known as "hunger" roots. An examination of the living roots will reveal the presence of the small white bodies of the females.

Spread of Infestations

Natural migration of nematode larvae does not exceed more than a few feet in a season. The pest, however, is readily spread by wind, irrigation water moving over infested soil, and in soil adhering to implements, farm workers, livestock and farm produce.

Control

Because the developing eggs are protected within the cysts, soil fumigation is not generally recommended for the control of the beet nematode.

In areas where this pest is present, susceptible crops should not be grown more than one year in four.

Suitable crops which can be grown in infested land are beans, peas, tomatoes, onions, melons, cucumbers, celery, lettuce and cereals.

Soils for Irrigation. The water soakage and water holding capacity of a soil to be irrigated should be studied so that irrigation application is efficient. Suitable soils should absorb water freely to the root zone of the crops. Clay soils absorb water slowly and need small flows continued for a long time. Sandy soils have a high soakage rate and the water may penetrate beyond the root zone, unless small amounts are applied at each irrigation. An ideal soil for irrigation is a loam or medium clay loam. These soils not only absorb water freely but also have the capacity to retain a great deal of water which is available for plant growth. Clay loam and clay soils can store a large amount of this available water, but sandy soils can hold only a limited amount. The advantage of irrigating soils that hold a large amount of water for plant growth is clear, as fewer applications are needed to maintain plant growth.

—*A. NAGLE, Irrigationist.*

pasture and crop

Safflower Spacing Trials.—Trials have been conducted at the Regional Experiment Station, Biloela, during five consecutive seasons, to ascertain the most desirable spacing for the planting of Horowitz safflower in Central Queensland.

Because it is grown during the winter, its water requirements must be drawn mainly from stored supplies in the soil. This in turn places emphasis upon the most desirable number of plants that can be grown in any given area. In other words, the most favourable spacing depends on both row spacing and on plant spacing within the row.

Results over the years indicate that yields of over 1,200 lb. of seed per acre can be obtained by employing 14 in. row spacing using 27 lb. of seed per acre or by using 18 lb. per acre when planting in 21 in. rows.

—W. A. R. COWDRY,
Senior Experimentalist.

Check on Johnson Grass.—Most people know that Johnson grass is a pest in cultivation but do you know for certain whether it's on your property? If you have one plant this season, next season you could have hundreds.

Johnson grass is easily recognised. It's a big grass with seed heads like Sudan grass but it has long white underground runners. Just pull a clump up by the roots and have a look—you can easily tell.

There's a new chemical to get rid of Johnson grass—dalapon. It's better than either T.C.A. or sodium chlorate and the cost per acre is less.

Spraying is a waste of money when the plants are past their prime. The best time to spray is spring.

The thing to do is to find out whether you have Johnson grass; where it is; and be ready to attack it in the spring.

—H. E. KLEINSCHMIDT, Botanist.

Furrow Irrigation.—Furrow irrigation is a fairly simple method, but failure to get uniform penetration of water to the root zone is a common problem. Penetration is influenced largely by soil type, furrow length, furrow spacing, and the rate of water flow.

To check the lateral spread and depth of penetration of the water, cut trenches at the top, middle and bottom of the field immediately after watering. These will show the penetration pattern. Irrigation is efficient if the water meets half-way between the furrows and the soil is wet down to the root zone.

Dry patches between the furrows mean that the furrows are spaced too widely or that the flow is too fast for the soil type and slope. If the top of the field is getting more water than the bottom, either the furrows are too long or the flow is too small.

—A. NAGLE, Irrigationist.

Certified Seed.—Recently a complaint was made about the quality of Queensland certified seed. When the complaint was investigated it was found that the seed was not certified seed. Obviously this was another case of mistaken identity of the seed.

Since the beginning of the certification scheme, emphasis has been placed on the ways in which a person can be sure whether seed is certified or not.

Briefly these are by the seal and label. All bags and packets of Queensland certified seed are sealed by a metal seal which has the letters DAS embossed on it. In addition, a certification label is attached to every bag of certified seed. The label will have the following details printed on it: Department of Agriculture & Stock, Brisbane, the kind of certified seed, particulars to which certification relates, a reference by which the history of the seed can be traced, and the signature of the officer sealing the bag of seed.

All certified tomato seed is placed in sealed packets. The packets will have printed on them details similar to those just listed.

When ordering certified seed, check the details mentioned and so be sure that the seed you buy is really certified seed.

—*N. V. HIBBERD,*
Senior Seed Certification Officer.

Points on using Methyl Bromide.—Prolonged illness or even death could be the penalty for a moment's carelessness in handling methyl bromide, which is now used widely for sterilizing tobacco seedbeds. It is a deadly and penetrating poison and must be used with extreme care or the farmer himself may be poisoned.

Dr. M. H. Gabriel, Health Officer, Department of Health and Home Affairs, has emphasised the dangers of using methyl bromide. This fumigant, supplied under pressure in cylinders or cans, vaporises immediately it is released. It diffuses through the air as a colourless gas that has no warning odour, and very little needs to be inhaled before poisoning occurs. Poisoning is caused usually by inhaling the vapour, but methyl bromide can also be absorbed through the skin. The liquid can cause quite severe burns on the skin, so if any splashes on you, wash it off immediately using plenty of water. Remove any contaminated clothing at once.

In using methyl bromide on seedbeds, the risk of spilling a can while introducing the liquid under the seedbed covers is a very real danger. If this happens, move out of the area for an hour or so to allow the vapour to escape. Perhaps the period of greatest danger is when you're removing the seedbed covers after fumigation. Then you could inhale a harmful amount before the vapour has had time to disperse. Unseal the edges of the seedbed covers a good while before you remove them and always work on the windward side so that the vapour will not be blown in your face.

Similarly, when you're introducing methyl bromide under the seedbed covers, work on the windward side of the seedbeds. Then, if any vapour escapes, it will be blown away from you. Don't smoke while you're working with methyl bromide as smoking can lead to carelessness. Any person who shows signs of methyl bromide poisoning—dizziness, vomiting, headaches or blurred vision—should be taken to a doctor at once.

—*A. WINTERTON, Agronomist.*

Managing Irrigated Pastures.—Well-managed irrigated pastures can be counted upon to carry two dairy cows to the acre. But the secret is good management. On badly-managed pastures, stocking rates can be disappointing.

The first point to remember is that pastures need careful irrigation. Overwatering is a waste of water and power, while underwatering, always inefficient, is often quite useless.

Your aim should be to wet the main root zone, usually no deeper than 15 in., even in deep soils. Don't guess, but use the probe to measure the depth of water penetration. Generally, pastures need 1½ to 2 in. of rain or irrigation every fortnight to three weeks in cool weather, but every 10 to 15 days in hot, dry periods. Borings with a soil auger will show you when the root zone is drying out and another irrigation is needed.

Being heavy producers, irrigated pastures are also heavy feeders and need adequate fertilizer. Topdressing with superphosphate at 1 cwt. an acre in autumn and spring is now a standard recommendation in most coastal districts.

Regular manure spreading will help to keep your fertilizer bill low and your pasture growing vigorously. Rank growth on manure patches is evidence of wasted feed and fertilizer. For best results, spread the manure while it is fresh. Upturned harrows, halves of truck tyres and board smearers are all useful. But don't use heavy tined harrows or renovators—these can damage the sward.

Without planned grazing you cannot hope to get the best from your irrigated pastures. Pastures should be subdivided into sections containing about a week's grazing. Each section should be strip grazed to ration the pasture intake, to prevent waste of pasture and to reduce the risk of bloat. Four to five weeks' spell between grazings is usually enough, but grazing and spelling should be adjusted to suit the seasonal growth.

—*A. NAGLE, Irrigationist.*

Field Control of Tobacco Pests.—Queensland tobacco growers have to contend with a range of pests that attack the roots, stems and leaves of the growing plant. Success of every crop depends, in part, on pest control measures.

Nematodes require early attention. These root pests are controlled by fumigating the soil with either EDB at 27 per cent. w/v or 12½ per cent. v/v, or DD used at the same rate. Fumigation should be done at least three weeks before planting out.

For three weeks after transplanting, tobacco should be sprayed weekly with a combined spray of either endrin and DDT or dieldrin and DDT. Endrin and dieldrin are used at a strength of 0.05 per cent. active ingredient, and DDT at 0.1 per cent. active ingredient. In a combined spray, each insecticide is used at its recommended strength.

In south-western districts, jassids are kept in check by these routine spray applications. Mites are controlled by fortnightly applications of kelthane at a strength of 0.05 per cent. active ingredient. Late sprayings should be timed by observations on the presence of young stages of the pests.

Leaf miner activity has been high on some farms in recent years, and difficulty has been experienced in dealing with the pests in these proportions. A new spray material, WL1650, a close relative of endrin, has emerged from trials as the most promising insecticide for controlling this pest. It is used at 0.1 per cent. active ingredient. WL1650 has special value as a spot treatment for leaf miner control if pest activity is high. It can be combined with DDT, endrin and dieldrin.

Either endrin or dieldrin at 0.05 per cent. active ingredient will control looper, leaf miner, stem borer, and cluster caterpillar. But neither gives sufficient control of budworm. This and other leaf and stem pests except looper are controlled by DDT at 0.1 per cent. active ingredient. Effective control of leaf miner and looper depends to a large extent upon the method of application. Complete cover of both leaf surfaces is essential. This can be achieved by using sufficient volume of insecticide, and paying particular attention to nozzle placement. In tobacco, insecticides should never be applied more often than weekly, nor at strengths greater than recommended.

—G. W. SAUNDERS, Entomologist.

More Cotton after Early Ploughing.—Early ploughing for cotton can mean more money in your pocket when the next harvest is taken off.

Examples of the higher returns that have followed early ploughing have come out of many cotton growing districts this year. One Callide Valley farmer was able to compare the performance of cotton grown after long and short fallows on his own farm. A planting made after a 10 months' fallow yielded 1,500 lb. of seed cotton to the acre, while another made on short-fallow land yielded only 800 lb.

Cotton land should be ploughed as soon as the previous crop has been harvested. The early commencement of cotton picking this year gives growers an opportunity to turn the land over in time to catch any autumn and early winter rains.

Crop residues should be dealt with by repeated discings or a rotary slasher, and then ploughed under. If the old stalks are ploughed under in autumn, they will be thoroughly rotted before it is time to prepare the seedbed. The seedbed will then be clean and free from trash.

At the first ploughing for the new crop, the land should be left in a cloddy condition. The uneven surface will trap the rains and help to prevent run-off that might cause gullying.

Water stored in the soil during the fallow is available to the crop in dry spells in the growing season. It has been estimated that when a crop is flowering and fruiting strongly, it needs about one-third of an inch of water a day. If you've stored 5 in. of water in the soil, you have a reserve of 15 to 20 days to carry the crop through between rain periods.

Having moisture in the soil also means that you can plant after only light planting rains. With ample stored moisture, you could plant after a fall of only 1 in., but in a dry soil you may need 2 or even 3 in. before planting would be safe.

Over the years, October and early November plantings have proved the most successful in southern and central Queensland. Early ploughing gives you the opportunity to plant early.

—W. G. STEELE,
Senior Adviser in Agriculture.

* * *

Brisbane Show Stock

Top: Portion of a team of 12 A.I.S. cattle entered by Mr. M. C. Lester, "St. Andrews" Stud, Glengallan, for the 1960 Royal National Show. Mr. Lester this year won the Brisbane Show butterfat title for the third time. He has built up a notable herd based on sires such as "Fairvale Ensign" and "Tabbagong Victory," from the Illawarra district. Bottom: Miss Georgina Bassingthwaighte with one of the "Woodlands" Hereford stud bulls that were destined to take top prizes in the 1960 Royal National Show. Some of the exhibits of the 1960 Show were seen on the properties visited by a party of journalists on a five-day pre-show tour organised by the Royal National Agricultural and Industrial Association of Queensland and the Shell Company of Australia.

Pick-up Of Farm Milk By Bulk Tanker

By V. J. BRIMBLECOMBE,
Senior Dairy Adviser.

No more washing or lifting of milk cans is an advantage offered to producers by the introduction of bulk pick-up of milk. No more waiting to assist the carrier with loading, is a second advantage claimed for this system—and there are others of equal, or more, importance.

This method of milk collection from farms has made rapid progress in the United States, and is also showing steady progress in New Zealand where it was introduced in 1949. Adoption of this form of pick-up in place of the conventional can collection was commenced experimentally in England and Scotland in 1954 and has since been extended.

The system has been in operation in Victoria and West Australia since 1956.

In Queensland, all raw milk dispatched to Brisbane's central pasteurising factories from country receiving centres is chilled and transported in well-insulated, stainless steel road tankers, and while the system of milk delivery from individual farms to factories is still confined to cans, the transportation of bulk milk direct from farms by tanker is now in the planning stage.

How It Operates

The bulk pick-up system of milk collection commences with the cooling of milk on the farm in a refrigerated, insulated, stainless steel storage tank. The milk is held at a low temperature by the automatic operation of an agitator and refrigerator until picked up by a bulk tanker. Each farm tank has sufficient refrigerated surface to cool the fresh, raw milk quickly immediately following milking to a temperature approximating 40 deg. F.

The tanker is an insulated, stainless steel tank, equipped with a suitable milk pump and hose connection. Equipment for milk sampling and special refrigeration (or ice) for storage of these samples is also incorporated with the tanker.

On arrival at the farm, the grader-driver is responsible for measuring the volume of milk in the farm tank and making the necessary book entries. Before removing the milk he starts the agitator, grades the milk and takes a sample for butter fat and quality tests. Milk is then pumped into the tanker and after the farm tank is emptied, the driver rinses it with clean water.

The farmer completes the washing and sterilizing of the farm tank.

When all milk from farms on the route has been collected the tanker is driven to the milk processing factory, where the milk is quickly pumped into the factory storage vats.

Normal practice is to collect milk once daily in the high production hot weather, and every other day during the low supply, winter months.

It is essential for the driver of the tanker to be a qualified milk grader.

Requirements on the Farm

Before the system can be implemented in Queensland many problems will have to be overcome, and much advisory work will be required.

Those who will be confronted with most of these problems will be the milk producers; for satisfactory and efficient bulk milk pick-up from farms, it is necessary for the producer himself and his farm equipment to meet the following requirements:

(1) The structural condition of the dairy premises must be satisfactory for the installation of the necessary equipment. A farmer would be very foolish to install expensive plant in an old building which requires substantial renovations. Before the equipment is installed his premises should be in a sound state of repair and capable of being maintained at a satisfactory standard of hygiene.

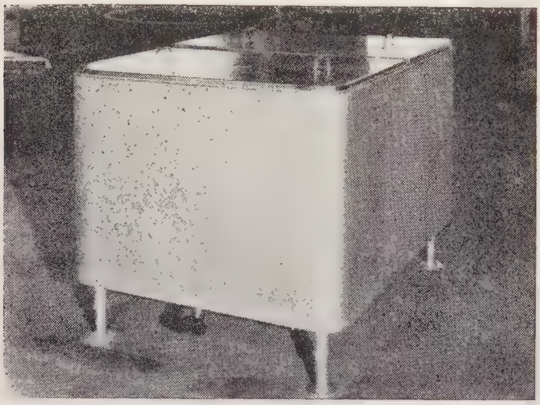

Plate 1

A Typical 200 Gal. Insulated Bulk Milk Vat to Store Milk which has been Externally Cooled.

(2) Electricity is considered a necessity so that cooling equipment could be operated automatically to maintain correct milk temperatures. Electric power is also necessary to drive the milk pump attached to the pick-up tanker. Where electricity is not available alternative power to drive the refrigerator could be used, but this would require careful operation to ensure efficient results and detract from the effectiveness of the ice bank form of cooling: Similarly independent pumping power would be required on the tanker for these instances.

(3) A refrigeration compressor unit would be required to provide cooling for milk and to maintain such milk at a low temperature.

In New Zealand, bulk milk pick-up commenced with external water cooling of milk and subsequent storage in uninsulated farm vats. Milk collection was based on twice-daily pick-up service. These collection conditions were concerned exclusively with milk for manufacture and it is interesting to note that where market milk supplies are collected refrigerated vats are required. In Queensland, with its heat and long haulage, refrigeration is imperative for a tanker pick-up system to be successful.

(4) A stainless steel bulk vat or tank adequately insulated, effectively refrigerated, and large enough to hold at least three milkings must be provided. Several types of vats are manufactured and the ultimate selection is a matter of personal choice, subject to the vat complying with regulations.

(5) An adequate supply of good quality water is essential. Besides the quantity used for routine dairy cleansing, the driver of the tanker requires approximately 10 gall. to rinse out the bulk farm tank before leaving the dairy.

(6) The dairy farmer must at all times produce milk of high quality. This is important to avoid any risk of rejection of his milk which could involve him in additional expense. Rejected milk must be heated for satisfactory separation. An additional problem if milk were rejected could be the transfer of the milk from the bulk storage tank to the separator vat. Refrigeration does not convert poor milk into good milk; its main purpose is to maintain the original quality of the milk from the time it is produced to the time it is purchased.

(7) A modified cleaning system which differs from that required for cans will be necessary. For bulk farm tanks chemical sterilization will be required in place of heat sterilization. However, even when milk is shipped in cans every care with hygiene is necessary to ensure first quality milk.

(8) Council roads, access roads and grids up to and in the farmer's property will have to be so constructed that they are trafficable in all types of weather for use by the truck tanker. A bogged tanker could not only upset the programme of milk collection, but also cause some disruption of operations at the pasteurisation plant. Farmers supplying liquid milk would be well advised if contemplating the erection of new dairy premises to build them reasonably close to a public highway to avoid the expense of farm road construction.

Types of Farm Vats

A bulk milk pick-up vat must be installed on a firm base, be solidly constructed and maintain the accuracy of its measurement of milk. A dip stick which is calibrated (together with the vat) under the supervision of a weights and measures inspector, enables the quantity of milk to be measured accurately. As checking of the calibration on the farm would be very inconvenient and costly it is necessary to ensure that tank construction and installation does not allow inaccuracies to develop following calibration.

Plate 2

A Type of Insulated Refrigerated Bulk Tank Employing the Ice Bank Cooling Method.

The vat must be provided with an agitator that will stir the contents quickly and thoroughly in order that a representative sample of milk may be taken. Cream quickly rises to the surface of the milk and, when chilled, the cream layer becomes hardened. To break this cream layer and to mix it adequately into the milk, vigorous agitation is required. Thus it is desirable for the agitator to be controlled at two speeds; slow for cooling and automatic temperature control, and fast for quick agitation and thorough mixing prior to sampling and pumping into the tanker.

Bulk milk vats may be constructed for three types of refrigeration, (*a*) those with direct expansion coils on the external surfaces of the vat, (*b*) those using the ice bank principle in which a reserve of refrigeration is stored as ice and (*c*) insulated holding vats in association with external refrigeration. Here milk is pre-chilled before storage in the vat.

Advantages to Producer

From the milk producer's point of view many advantages could accrue from bulk milk pick-up, and these should, over a period of time, compensate him for the high capital cost of installation. The following are some of the advantages:

(1) The costs of maintenance and replacement of milk cans and water coolers will be eliminated. However, some depreciation costs must be allowed for the bulk tank.

(2) An improvement in milk quality can be expected. Milk cooled to 40 deg. F. and maintained at that temperature, if produced under hygienic conditions, will maintain its quality much longer than milk in cans at higher temperatures. The effect on milk quality of the use of faulty and rusty cans and cracked lids will be eliminated.

(3) There is no loss of milk or fat from spillage or adhesion to the inside surfaces of the cans.

(4) There is greater economy in dairy operations by less handling, washing, filling and storage of cans.

(5) Relations between farmer and factory should be good, because controversy regarding weights and quality will be eliminated. The farmer can see his milk being measured, graded and sampled if he wishes, and can discuss discrepancies on the spot with the driver.

(6) Working conditions will be more pleasant, making the dairy routine more acceptable. Bulk farm milk pick-up could make life more pleasant for the whole family.

The Cost

Against these advantages must be weighed the capital outlay for the bulk milk tank. While the capital costs will be determined by the type and size of vat installed, present day costs for a 200 gall. capacity stainless steel, insulated, refrigerated tank with associated compressor approximates £1,000. It is usual for factories to pay a premium on milk collected in this manner to assist producers in the early years. The extent of this premium is of course a matter of individual determination.

Economy for Factory

From the wholesale factory's point of view there are also many advantages from bulk farm pick-up. The more important ones would be:

(1) The elimination of factory equipment normally used for receival of milk in cans, namely, can conveyors, milk weighing equipment and can washing facilities and economy in maintenance and replacement of such equipment. Of course, this will occur only where all milk is supplied in bulk tankers.

UNITED DAIRIES

Plate 3

A Bulk Milk Tanker in Use in New South Wales. Note the small rear compartment containing a special milk pump.

(2) Economy in factory operations, that is labour required to operate the equipment.

(3) Economy in refrigeration requirements. Bulk raw milk at the processing depot is stored at a temperature of approximately 40 deg. The bulk haulage tanker, because it is insulated, usually maintains the original farm temperature of the milk during transit to the factory. Therefore, milk temperature on arrival at the wholesale factory would be in the vicinity of 42 deg., and should be not greater than 45 deg. Refrigerated milk transported in cans on hooded vehicles usually arrives at the factory in the summer time at a temperature ranging from 60 to 70 deg. even though it may have been 45 to 50 deg. when picked up at the roadside adjacent to the farm. The introduction of this system of pick-up can thus result in a saving in refrigeration requirements of 15 to 25 deg.

Tanker Must Have Paying Loads

The relationship of existing carriers to this system demands serious consideration. As most carriers are private operators, economic factors have to be considered.

Firstly, it would cost a carrier about twice as much to provide a pick-up tanker vehicle as compared with the conventional truck used for can pick-up. Therefore, his initial capital outlay is doubled. To offset this, together with associated depreciation, the tanker owner must increase his loading volume. He must keep his tanker moving with a paying load. This would entail the use of the tanker for two, preferably three, paying trips per day. This could be done by operating on three farm pick-up routes or obtaining one to two loadings of bulk milk from nearby country factories.

Secondly, the driver of the tanker would have to be a competent milk grader possessing a milk grading certificate from the Department of Agriculture and Stock. Only with these qualifications would he be competent to grade suppliers' milk. He would need to be firm in his decision on milk graded, particularly where poor quality milk was encountered, as one pick-up of poor quality milk could jeopardise the quality of the whole tanker load.

He would have to be dependable and honest. As it would be his duty to measure the quantity of the milk and sample the milk for composition and quality, he would be required to be very careful in the methods employed.

The advantage to the driver in a bulk milk pick-up scheme would be the saving in energy used in loading and unloading the cans, and possibly waiting time at the wholesale factory o which a large number of delivery vehicles are operating.

The owner-driver may also be required to cleanse and sterilize his tanker (usually this is done by a factory operative). It would be the driver's responsibility to satisfy himself that uppliers' produce was being discharged into a clean sterile tanker.

For any farm bulk milk pick-up scheme to be uccessful there is a gallonage limit at which it s uneconomic to pick up supplies. On every milk route there are small producers as well as large ones. The installation of this pick-up system could involve the small producer in costs which he could not afford. A possible alternative for these producers could be every other day pick-up. However, in these latter cases there could be a risk of deterioration in quality particularly where strict attention to hygiene is not practised on the farm. Where adjacent routes are involved in any rearrangement for a tanker pick-up system, arrangements could be made for a complementary can pick-up of small producers' milk.

This modern trend in milk handling could revolutionise production, transportation and factory receival of milk in this State. Queensland, because of its climate and levels of milk production, possesses conditions which indicate the adoption of this form of milk collection could be of a long-term nature. However, with sound organisation and co-operation on the part of all concerned, bulk milk pick-up could bring benefits to the entire milk industry. Information on this form of milk collection is available from the Department of Agriculture and Stock.

It is desired to acknowledge with thanks the supply of photographs from Frigrite (Qld) Pty. Ltd. and Bryant Bros. Pty. Ltd.

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Twins on Show

Seen on the R.N.A.-Shell Journalists' Tour was this Friesian cow with newly-born twin calves on the "Freshfields" Marburg stud of Mr. S. E. G. MacDonald. Mr. MacDonald maintains a high milk yield by scientific feeding, which embraces lucerne and concentrates, orghum conserved in silo pits, winter oats, and 30 acres of irrigated pasture. This stud holds two Australian All Breeds Milk Production records, including the impressive achievement of 11½ gal. for a twice daily milking, and seven Queensland production records. Journalists voted the tour eminently successful as a unique means of seeing behind the scenes of Queensland's major show.

Safety Rules For Users Of Portable Electric Tools

It is most important to ensure that electric tools are correctly connected to the power supply, that all leads are in good condition and that the tools are maintained in a safe condition and always used in a safe manner.

Installation

Use only 3-core flex of the tough rubber or plastic sheathed types. Make sure that the flex is correctly connected to the tool and to the 3-pin plug; and that a cord extension socket is used where an extension lead is necessary. Incorrect connections can expose the user to electric shock.

The metal casing of an electric tool must be effectively earthed in case it becomes alive. The earthing conductor of the flex is coloured GREEN. It must be connected to the earthing pin marked "E" or "Earth" on the 3-pin plug or cord extension socket, and to the earthing terminal of the tool. Note: 2-pin power points and lampholders are NOT earthed and must never be used for electric tools.

Have the following checks made by a qualified electrical tradesman:

1. That the main earth wire of the installation is not broken or disconnected.
2. That the power points are properly earthed 3-pin outlets.

NOT all 3-pin outlets are earthed.

Maintenance

Make regular checks to ensure that the tool is safe to use and observe the following precautions:—

(1) *The Tool.* Do not use the tool if the casing is broken or damaged. Make certain the brush caps are intact and firmly in position. Take care not to damage the flex when using the tool. If you do—let go the tool—turn off the power and remove the plug from the outlet. Do not touch either the tool or the flex until this is done.

(2) *The Flex.* See that the sheathing of the flex is securely held at the tool. Examine the flex regularly and have it renewed if damaged. NEVER join by twisting and taping—use a properly connected plug and cord extension socket.

(3) *Plugs and Cord Extension Sockets.* Use only robust types and replace if cracked or damaged. Check all screws regularly for tightness.

(4) *The Main Earth Wire of the Installation.* Locate where it is situated and check from time to time. If it should become damaged or detached, call an electrical contractor.

Use

Do not overload the tool so that it stops and overheats. It is better to stand on dry wooden flooring than on damp ground when using the tool. Keep the tool dry and clean. If anything unusual happens—a blown fuse, failure of the tool to operate, excessive sparking or heating—switch off the power, pull out the plug, and have both tool and flex examined by a qualified electrical tradesman.

Above all—do not interfere with the tool or cord fittings if you are not qualified to do so.

Glycine On The Atherton Tableland

By G. W. KYNEUR, Agronomist.

The first plantings of *Glycine javanica* at the airi Regional Experiment Station were made in 947 and this patch gave good production until was ploughed up in 1959. Approximately 9 ons of green material per acre were ploughed in. Plates 1, 2 and 3 illustrate this plot at various tages.)

Because of the very limited seed supply in the arly years, the area was used for seed produc-ion only and was not grazed. However, as tock gained access and other areas were sown, was shown that under grazing the legume was uite palatable, and was spread to some extent y grazing animals. In this connection its real alue would seem to lie in its ability to supply a ore balanced diet for dairy stock, when grown s the legume component in a pasture.

Furthermore, the soft, leafy material produced uggested its value for pig-raising, which is arried on rather extensively on the Atherton ableland in conjunction with dairying.

Plate 1

Glycine Planted in January, 1950, Completely Covered the Fence by May, 1952.

Yields

Glycine is used in conjunction with Rhodes grass, green panic, guinea grass and kikuyu grass. Previously, lucerne was used as the legume component but it was not satisfactory because it would not combine at all with guinea grass or kikuyu, and could not supply the large quantities of nitrogen required by Rhodes grass and green panic.

In the mixed pasture areas, the grass is invariably greener and the growth heavier when compared with grass which has no glycine component. Cattle usually show a marked preference for the mixture rather than the pure stand of grass.

A close-up view of a green panic-glycine pasture mixture, taken during autumn, is shown in Plate 4, and the nice balance between grass and legume can be seen. (Compare this with Plate 10 which was taken during spring.) This is about the ideal balance to aim at for this time of the year, though considerable variations will inevitably occur, owing to the different responses to temperature by the two components, and depending on seasonal variation from year to year.

Actual yields have been taken at various times, apart from the ungrazed plot used for seed in the early years.

In order to illustrate the drought-resistant quality of glycine, Table 1 has been included. This gives the relative quantity of forage available at October 30, 1957, in the Rhodes grass-glycine mixtures at a time when the effect of the 1957 drought was being felt very severely in this district. It will be noted how the old stand provided sustenance, although the moisture content was extremely low.

TABLE 1

Date Planted	Yield of Available Fodder		Moisture Content
	Rhodes Grass	Glycine	
			Per cent.
March 1957 . .	Negligible . .	2·2 cwt./acre	50
February 1955 . .	Negligible . .	8·1 cwt./acre	52

A storm yielding 3 in. was received one week later, and in order to illustrate the quite phenomenal rate of regrowth—provided sufficient moisture and warmth are available—cuts were made in the same paddocks only eight weeks afterwards. The figures obtained then are given in Table 2, and show the remarkable recuperative power of the glycine in the stand, as well as the slower regrowth made by the older stand of Rhodes grass.

TABLE 2

Date Planted	Yield of Available Fodder		Moisture Content	
	Rhodes Grass	Glycine	Rhodes Grass	Glycine
			Per cent.	Per cent.
March 1957 . .	12·3 cwt./acre	4·8 cwt./acre	. .	. .
February 1955	9·7 cwt./acre	30·0 cwt./acre	77	68

The results of the incorporation of this legume with green panic in a pasture mixture has also been quite marked, as can be seen from the data in Table 3. It is pointed out that all areas mentioned were mown off on the same date. As the areas are adjacent to one another, soil variation is not great, and the yields quoted are comparable.

Plate 2

Glycine, 2 Years Old, Showing Ground Cover (9 Tons Per Acre) and Weed Smother.

Plate 3

Glycine on the Same Area as Plate 2, One Year Later.

TABLE 3

YIELDS OF GREEN PANIC WITH AND WITHOUT GLYCINE

Pastures and Paddock Number	Yield of Available Forage as at 7–11–57 after 3 Months Drought
Pure green panic grass (K6–7) . .	5·0 cwt./acre green weight
Glycine-green panic mixture (K6–7)	16·25 cwt./acre green weight
Pure green panic grass (K14–15) . .	5·5 cwt./acre green weight
Green panic-glycine mixture (L1) (glycine sparse)	17·6 cwt./acre green weight
Green panic-glycine mixture (L2) (glycine dense)	27·5 cwt./acre green weight

Results were very similar when glycine was the component in a mixture with guinea grass. Table 4 gives the data obtained.

TABLE 4

YIELDS OF GUINEA GRASS WITH AND WITHOUT GLYCINE

Pastures	Yield of Available Forage
Glycine-guinea grass mixture . .	17 cwt./acre green weight
Pure guinea grass	9 cwt./acre green weight
Glycine-guinea grass mixture . .	19·75 cwt./acre green weight

Another example of the capacity of glycine to improve the quality of the grass is furnished by a comparison of three pastures, two of which were planted to grass and one to a mixture of grass plus glycine in February, 1957. The land had been under maize for about 11 years.

By the end of 1958 it was quite obvious that the grass in association with the glycine was greener than that in the pure grass areas and it was carrying more stock.

Plate 4

Glycine–Green Panic Mixture.

During October, 1959, the available fodder on he 4 acres of the two pure grass areas was sparse and of low palatability and fed a herd of 17 cows for only two days, whereas in the grass-glycine area, there was sufficient fodder on 2 acres to feed the 17 cows day and night for hree weeks. The high value of the grass-glycine mixture was due to the quantity of feed provided by the legume itself and to the improved quality f the grass.

TABLE 5

Type of Pasture	Amount of Feed Available Cwt. Dry Matter Per Acre	Crude Protein Content
		Per cent.
Kikuyu grass	8·44	5·3
Rhodes grass	7·14	4·2
Green panic-glycine mixture, as—		
(*a*) Green panic	8·10	8·2
(*b*) Glycine	23·10	15·8

Table 5 illustrates the amount of feed available in October, 1959, in each of the three pastures. (The yields are expressed on a dry matter basis as moisture contents are so variable and may not be related to the treatment.)

Photographs show the differences in growth and ground cover of the three pastures. Plate 7 shows the mixed pasture, Plate 8 shows the kikuyu pasture and Plate 9 shows the Rhodes grass pasture. Plate 10 shows the cows grazing the mixed pasture.

Glycine, in common with most perennial tropical legumes, makes rather slow growth during the first year after establishment, and this often sets serious problems of weed control.

In order to investigate the reasons for this, and endeavour to overcome this inherent slowness, investigations into the nodulation of this

Plate 5

Strips of Glycine Three Months Old.

Plate 6

Close-up of a Strip of Glycine Three Months Old.

legume were conducted, and Plates 5 and 6 illustrate the growth of glycine in some of the plots three months after planting. The yield of green fodder averaged 14 cwt. to the acre, but within a further three months they averaged over 2 tons to the acre. However, no particular strain of rhizobium proved superior, while a dressing of sulphate of ammonia did not greatly help, so that further work on other avenues needs to be undertaken.

Value for Grazing

The value of glycine for the grazing of both cattle and pigs was early realized. On the Atherton Tableland lucerne makes its main growth during the spring, but the plant population gradually decreases each year until, at the end of five or six years, the stand is too sparse to be of much use. Glycine, however, from a light seeding of 2 to 4 lb. to the acre increases

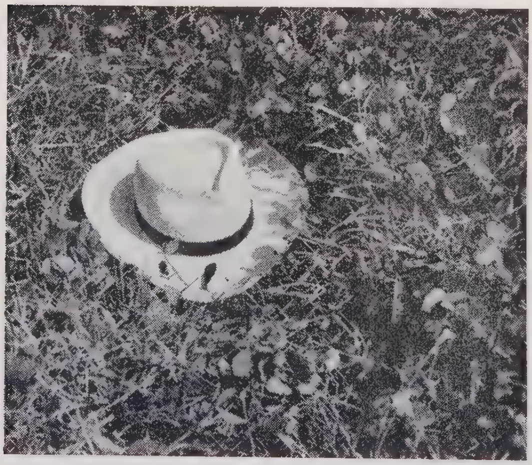

Plate 7

Mixed Pasture, Planted January, 1957, and Photographed October, 1959.

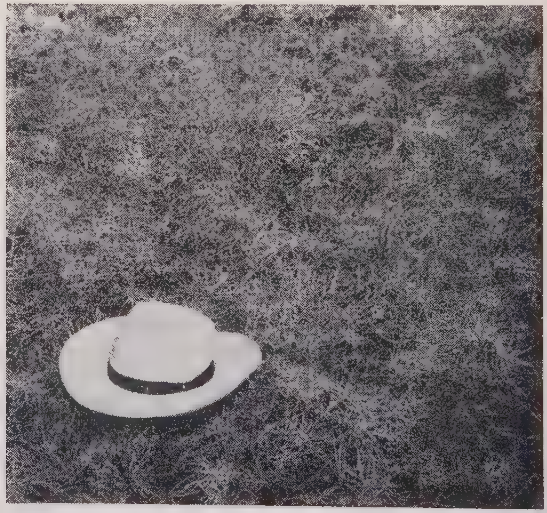

Plate 8

Kikuyu Pasture Planted January, 1957, with No Legume Components. Photographed October, 1959.

Plate 9

Rhodes Grass Pasture Planted January, 1957, Photographed October, 1959.

Plate 10

Cows Grazing the Green Panic–Glycine Mixed Pasture, Photographed October, 1959.

n density each year until (if not properly nanaged) it will smother most plants competing vith it.

It is a prolific seeder, and the shattered seed vould appear to have a high germination apacity. It may also, under certain circumtances, spread by runners. On the other hand, t is not so drought or frost resistant as lucerne.

The grazing value of lucerne is superior ecause of its greater palatability. But because of its better ability to benefit the associated grass, glycine has considerable indirect value, and forms a grazing mixture which thereby is more palatable and nutritious. With correct management, the glycine can be kept in check so as not to choke out the grass.

Its ability to produce such large amounts of soft, leafy forage suggested its value for pig grazing. Lucerne had previously been the only perennial legume available for this purpose, and

Plate 11

Glycine–Kikuyu Mixture in Pig Grazing Paddock.

Plate 12

Feeding Glycine Vines into the Header.

Plate 13

Glycine Vines at Rear of Header. These were fed through repeatedly until all the seed was removed.

it was quite satisfactory provided that it was carefully managed. But this meant that the pigs could not be left on it for any length of time, and that special measures were necessary to curtail weed growth during the summer months.

Glycine has been found to be quite palatable to pigs, and it was therefore planned to use this legume to provide the protein supplement when the pigs were grazing such crops as arrowroot and sweet potatoes.

The grazing capacity of such a combination has been proved to be considerable. For example, an area of 1½ acres, divided into equal areas of glycine, arrowroot, and sweet potatoes, was found to be able to support one brood sow (or its equivalent) for 250 days and there was grazing to spare at times. Plate 11 shows a mixture with kikuyu grass that was grazed readily by the pigs.

Several large areas have now been planted in mixtures with grasses to provide grazing for the herd of dairy cattle. The beasts do not show so strong an attraction for the glycine as they do for lucerne, but they do eat it, and very often it is more attractive during the hot, dry, early-summer weather, when it may be the only green growth in the pastures.

Conserving Excess Pasture.—Grass-glycine mixtures are valuable for silage making. During the autumn of 1959, a nine acre paddock of green panic-glycine was closed up for 2 months and then cut for silage. The yield was 10 tons to the acre, consisting of 4 tons of grass and 6 tons of legume. The material was ensiled in a trench using a flail type forage harvester and the silage was quite satisfactory.

Soils and Nutrient Requirements

Glycine seems to grow satisfactorily on the soils of the Tolga–Atherton–Malanda area, provided that erosion has not been serious. The red basaltic clay loams of the area are fairly uniform and there is every indication that the plant should grow quite satisfactorily on them. However, on soils derived from granite, which are usually shallow and severely eroded, the growth is slow and the glycine requires about two years with little or no grazing to establish itself and spread.

From Malanda to the southern edge of the Tableland, higher rainfall—especially the cold drizzle of the winter months—may not suit glycine and the higher soil acidity may also retard its growth. These factors have yet to be investigated in relation to glycine growth.

Little is known of any specific mineral nutrient deficiency affecting glycine growth on Tableland soils and no visual responses have yet been observed in the small-scale pilot tests so far carried out. Investigations along these lines are continuing.

Seed Production

In the early years of its establishment, seed production was the main aim, since no other source of supply was then available.

The method used was slow and costly, the vines being cut by hand from fences and tall weeds where seed formation was the heaviest.

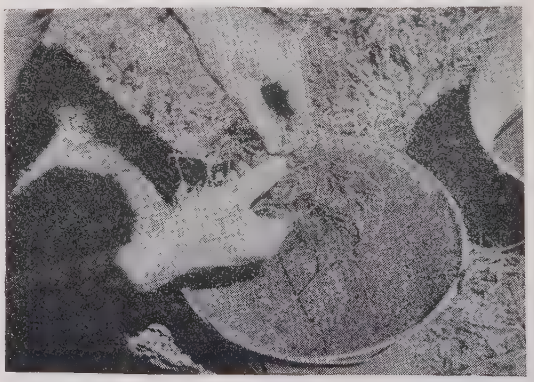

Plate 14

A Bucket of Clean Seed and a Handful of Seed Pods.

Plate 15

Clean Seed After Final Sieving by Hand.

The pods were then allowed to open, being caught on concrete or tarpaulins, the whole mass of vines having to be turned frequently to facilitate drying out.

An improvement in efficiency was obtained by modifying a header to thresh the vines before opening of the seed. The vines were allowed to dry for a day and then passed several times through the header until the majority of the seed had been threshed. Plates 12 to 15 illustrate this method.

On areas where, in certain seasons, frosts are not experienced, considerable success may be achieved in the harvesting of glycine for seed by the use of a forage harvester. This machine chaffs up the whole of the above-ground portion of the plant and feeds it into a trailer, so that it can be conveyed to a suitable place for drying and threshing. No difficulty has been experienced in threshing this material and after winnowing the sample of seed is of good quality.

For immediate use, however, it is not necessary to thresh the chaffed-up material, which can be broadcast quite readily over the area to be sown.

Because of the obvious advantages that glycine possesses, the incorporation of this legume in pastures of various kinds of grass on the Atherton Tableland is strongly recommended. Judicious management will need to be practised, however, to provide grazing as quickly as possible, and in order to maintain a good balance between grass and legume at the most critical periods of the year.

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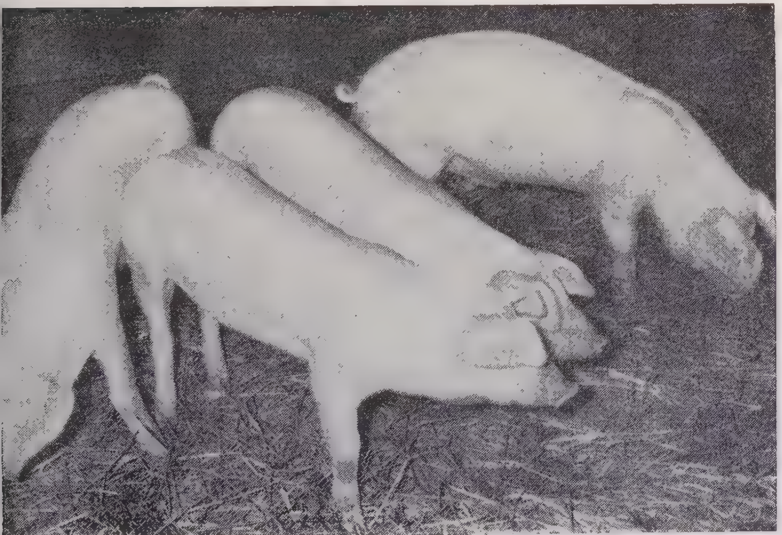


Landrace Baconers Meet The Press

These Landrace baconers were inspected during the R.N.A.-Shell 1960 Journalists' Tour. They were at the "Glenroy" stud piggery of Messrs. W. F. Kajewski and Son, on the Darling Downs. Mr. Kajewski told the touring party that these four baconers were 3½ months old; the top weight was 132 lb. A litter of nine pigs from a 12 months old sow averaged 40 lb. at birth and 99½ lb. at 2 weeks.

stock and station

Drought Feeding with Grain Sorghum.—In an experiment at the Animal Husbandry Research Farm at Rocklea maiden heifers group-fed in yards with 3 lb. crushed sorghum grain per head per day showed a high rate of survival.

Four groups, each of 10 heifers, were fed the ration with the addition of 1 per cent. ground limestone. One group (No. 2) also had 0.5 per cent. salt added to its ration.

Although all animals lost considerable weight during the trial only two died—one each in groups 1 and 3.

A pre-trial period of three weeks was occupied in bringing the cattle on to the all-grain ration. The times of feeding and the average live weights of the groups at the commencement and conclusion of the 26 weeks all-grain period were as follow:

Group 1 (fed daily)—462/356 lb.—loss 106 lb.

Group 2 (fed daily—salt added)—464/381 lb.—loss 83 lb.

Group 3 (fed twice weekly)—460/364 lb.—loss 96 lb.

Group 4 (fed weekly)—464/335 lb.—loss 129 lb.

At the end of the grain feeding period five animals from each group were turned out immediately to pasture. The remainder were fed with lucerne chaff for one week prior to turning out and it was found that the animals that had been fed intermittently consumed greater amounts than those fed daily. After 7 weeks the average live weight gains were:

Group 1, 151 lb.; group 2, 136 lb.; group 3, 177 lb.; group 4, 182 lb. Although some of this gain must be attributed to "rumen fill" the figures indicate the rapid recovery of the cattle on pasture.

On the basis of this trial it would appear that twice weekly feeding is the most satisfactory.

Immunity of Calves to Tick Fever.—Cattlemen generally believe that calves from tick infested cows possess an immunity to tick fever.

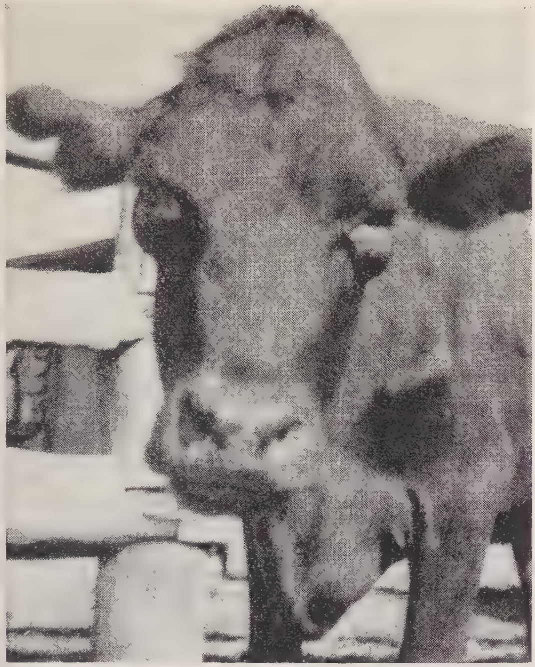
In an experiment conducted at the Oonoonba Animal Health Station two groups, each of nine pregnant cows were used to test this theory. No. 1 group was inoculated three times during pregnancy with blood containing a tick fever organism, *Babesia argentina,* while No. 2 group remained untreated. Eight calves from each group completed the trial.

In the calves from No. 1 group, six up to 35 days of age showed no clinical symptoms of tick fever following inoculation with infected blood, while one inoculated at 43 days of age and one at 52 days reacted to the injections. Blood taken from all eight calves was subsequently proved to be infective by inoculation into susceptible animals.

The eight calves from No. 2 group were also inoculated with infected blood and all reacted more severely than any in No. 1 group.

To check whether the immunity of the No. 1 group calves had been conferred by pre-natal infection, blood was drawn at birth from members of this group and injected into susceptible animals previously prepared by surgical removal of their spleens. None of the recipients showed evidence of infection. This indicated that a passive immunity derived from their infected mothers had protected the calves from the disease.

antana Poisoning.



This severe case shows a typical swollen nuzzle with a raw surface, swollen eyelids and hickening of the ears. On account of the ensitivity of the skin to sunlight, affected cattle eek shade and keep their eyelids closed.

Severe liver damage causes loss of appetite, lepression and jaundice.

There is no specific treatment. However, some elief can be provided by drenching with up to gal. of paraffin oil to empty the bowel. Sugar s used to strengthen the animal and provide ome protection for the liver. Affected animals hould be given access to shade.

—O. H. BROOKS,
Divisional Veterinary Officer.

Poisoning of Working Dogs.—Working dogs requently suffer harm because of the carelessness or lack of thought of their owners. Recently everal cases of poisoning have occurred which ave been attributed to dieldrin or aldrin dipping luids.

Some of the dogs became poisoned by drinking pilt jetting fluid (where no water was provided or them), others by absorption through the skin ollowing dipping for dog ticks, and one by licking reated house stumps.

Symptoms resembled poisoning by strychnine. The first fits lasted from 10 to 20 minutes but as the condition progressed their duration shortened and the intervals between them increased. During the period between fits the dogs walked with a high-stepping, jerky type of gait and carried their heads higher than usual. In some cases the symptoms were confused by owners with those of distemper.

Treatment was not very effective. Of nine cases reported, two recovered after treatment with a sedative (nembutal), two after no treatment of any kind, and the remainder died.

To prevent occurrences of this nature, working dogs should be provided with clean water to drink at the dipyards and should be restrained from lying in pools of dipping fluid, or in the vat, to cool off.

Tranquillizers for Pigs.—Tranquillizer drugs have been used successfully in Queensland to control after-farrowing viciousness in sows.

Tranquillizing drugs have made an impact on veterinary medicine. Removing psychological stress, they make vicious, timid or uncontrollable patients easy to manage. Tranquillizers are already being used in Queensland to restrain horses for brief surgical operations, for treating shock and for quietening vicious or difficult-to-manage dogs and cats.

Overseas, these drugs have also been found useful when placing range pullets into intensive laying houses. But little information has come forward on the use of tranquillizers in pig farming. One claim, however, has been made of their value in treating after-farrowing hysteria in several forms.

Recently tranquillizers were used on a piggery near Brisbane to control viciousness in a sow found savaging her young. This usually docile sow had bitten and killed the first two of her litter while still farrowing, and had attempted to bite a third. About half an hour after the injection of a tranquillizer, the unsettled sow became quiet and seven more piglets were born without incident. The sow mothered them quite normally. The owner later reported successful treatment of another sow affected with after-farrowing viciousness.

Savaging their newborn piglets is not uncommon in sows. The attacks may occur during farrowing or soon after.

Tranquillizers could be an answer to this problem. Besides quietening the sow and preventing attacks on the piglets, difficulties arising from separation of the piglets from the sow would be avoided.

—P. D. Ranby, *Veterinary Officer.*

Preparing Grain for Pig Feeding.—Pigs are able to handle a big range of grains in their ration, but do not get full nutritional value from them unless most of these grains are given some treatment before feeding. Maize, because of its large size, is the only grain that can be fed successfully without any special preparation.

Small, hard grains like wheat, sorghum and skinless barley give best results if crushed or ground before feeding.

Awned barley and oats have fibrous seed husks and should be ground to break up the fibrous material. Ground, these grains are much more palatable and are digested more completely than the untreated grain. Because of the high fibre content, don't exceed 30 to 40 per cent. of oats in the ration for growing pigs.

At times when their value as cash crops is low, many other grains are fed to pigs. These include the so-called small grains—millets and canary seed. Grains like these have two common characteristics—they are small and have hard, fibrous seed husks.

If you feed the grain whole, much of it will pass through the pigs undigested. Crushing or grinding makes the small seeds more digestible and, in consequence, a more efficient pig food.

In feeding value, the small grains, when crushed, are not far behind maize, wheat and sorghum. But if fed heavily and continuously, they have a tendency to cause the formation of a soft, oily fat.

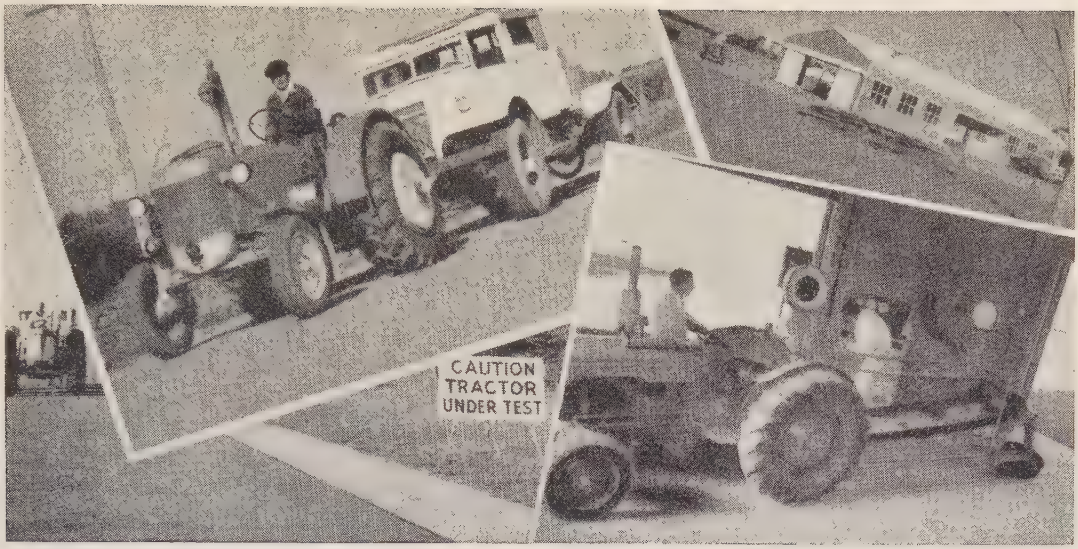
To avoid producing oily bacon pigs, restrict canary seed and millet to not more than 40 per cent. of the pigs' ration. In Agriculture Department trials last year, this quantity of small grains in the ration was found to be the most suitable. It gave growth results similar to those obtained from feeding wheat, barley and sorghum.

—F. Bostock,
Senior Husbandry Officer, Pig Branch.

◆

Journalists Inspected Him

This Red Sindhi bull at Gatton College is being used in cross-breeding experiments designed to develop a tropical dairy breed of cattle. Simultaneously, cross-breeding projects are being carried out by C.S.I.R.O. in the south and the Department of Agriculture and Stock in the north. Journalists on the R.N.A.-Shell 1960 Queensland tour were shown over Gatton College by the Principal, Mr. N. W. Briton, and his staff.



Tractor Testing In Australia—I

By G. H. VASEY,
Officer in Charge of Tractor Testing,

and W. F. BAILLIE,
Testing Officer, University of Melbourne.

Australia is one of several countries that have et up "official" tractor testing schemes. These chemes involve setting up testing stations that, while providing a testing service on the one hand or tractor manufacturers and on the other hand or tractor users are independent of both.

Unless the tests are compulsory, as in Nebraska, they are better described as "formal" ather than "official." The following paper sets ut the origins and scope of formal testing of ractors, particularly in Australia. A second paper will describe the test procedure.

Origin In Nebraska

The origin of all the present tractor testing chemes can be traced back to the "Nebraska ests" of the U.S.A.

In 1919 the legislature of the State of Nebraska passed a law requiring anyone wishing to market a tractor in that State to have a sample stock model tested by the University of Nebraska; the Act also required that the test report be published.

The primary object was, simply, to provide a check against the extravagant advertising claims and correspondingly poor tractors being made by some makers who were cashing in on the new wonder—the iron horse—after the First World War had shown these machines to be possible.

It will be recalled that the tractor only began to make its appearance in the years immediately following the war; many wild-cat companies entered the field with little or no experience to back their products; many hopeless designs were put on the market. Farmers, of course, had no way of assessing these machines, whether the claims made for them were valid or outrageous.

The Nebraska tractor test law was designed to cope with this situation. The law soon effectively covered the whole of the U.S.A. since a manufacturer could not risk the obvious implication of selling everywhere but in Nebraska!

As time went by, the bad were sorted from the good; the reputable makers were quick to see the advantage of being able to base their advertising on an attested report from an independent authority with the high standing of the University of Nebraska.

More than 700 separate makes and models have passed through the Nebraska tests since 1919. Although field-day tests of tractors had been organised in England in the early twenties and thirties, and indeed at Werribee in Victoria in 1918, it is obvious that the Nebraska law and the Nebraska test scheme effectively started the notion of tested and certified tractors.

AUSTRALIAN SCHEME

Until the Second World War, most of the tractors used in Australia were imported from the U.S.A. and so were in effect certified by the Nebraska test—for those who cared to read or use the certificate. But in the expansion of mechanised farming after the war, many tractors came to Australia from Great Britain and Europe unaccompanied by a test certificate.

Furthermore, even with the tested American models the amount of Australian content going into their assembly here was increasing, so that overseas tests were not always strictly applicable.

Besides these importations, some interest was being shown in the design and manufacture of tractors in Australia.

Taking all these factors into account, the Commonwealth Government sought to strengthen the interests of Australian farmers, and to provide itself with proper bases for such fiscal matters as duty and bounty, by setting up a tractor testing scheme in Australia broadly along the lines of the Nebraska tests.

At first the work was entrusted to the Aeronautical Research Laboratories of the C.S.I.R. at Fisherman's Bend. Using test procedures exactly the same as those at Nebraska, the Aeronautical Laboratories tested 23 tractors between 1946 and 1951. But, as a result of departmental changes in the laboratories, the scheme was abandoned in 1951, and reconstituted on a new basis in 1954.

Co-operation

The new scheme was developed by the Commonwealth and State Governments, through the Australian Agricultural Council, that called for co-operation between the several governments and the University of Melbourne; (in the early stages the Bureau of Sugar Experiment Stations acted instead of the State of Queensland). Under the terms of this agreement, the Commonwealth was to meet half the cost, the States the other half (in proportion to their tractor populations), while the professional services were to be provided by the University.

Among the conditions laid down by the University for its participation in the scheme was that it should have full discretion in all technical matters, and that its officers appointed to carry out the tests would not only be permitted, but should be expected to carry on research work on tractors and related matters.

The scheme was to be a voluntary one, as it is in England, and for that matter, in most other testing stations. That is to say a testing service was set up: the companies would use it, and submit tractors for test, if they saw merit or advantage in it.

At the same time the scheme was expected to recoup some of its expenses by charging test fees (the Nebraska scheme runs itself on its income from test fees, which are substantial).

These principles having been laid down, the Tractor Testing Committee* was formed comprising an officer of the Commonwealth Department of Primary Industry as chairman, an officer of the Victorian Department of Agriculture representing the interests of all the States, and an officer of the University of Melbourne.

The first tests were done in makeshift premises at Fisherman's Bend and the State Research Farm Werribee, beginning in 1954. By 1957 a Testing Station was built on the property of the Research Farm. In all, some 10 models of tractors, over 20 spark arresters, and a variety of other engines and tractor equipment have been tested.

Meanwhile, the test procedures themselves have undergone some changes, so that today the Australian test system is in some ways ahead of its counterparts overseas.

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* The address of the Tractor Testing Committee is: care of Department of Primary Industry, 301 Flinders Lane, Melbourne C.1., Victoria.

Nature of the Tests

It will be appreciated that the formal testing f tractors is in no sense a competition between ival makes; it is not a question of testing this nodel of tractor against that, but of measuring he performance of the given tractor in a tandard manner.

Nor is there any law, regulation, rule, or ndustrial standard that says a tractor shall have his much power, or pull, or speed, or fuel onsumption. The only limitations imposed on he tractor, the only standards to be reached, re those imposed by its own instruction book, nd the claims made for it.

Each tractor under test goes through a certain tandard set of procedures and inspections that mount in the end to a measurement of the ractor and its performance and qualities.

The test procedures will be described in the econd article of this series. Briefly, they consist of: (*a*) a survey of the physical properties of the ractor, (*b*) the power capacity of the engine nd of the p.t.o. and belt outlets, (*c*) the power n the drawbar in the several gears, and (*d*) bservation of the tractor under test and detailed nspection afterwards.

The testing procedure eliminates as far as ossible matters of opinion; it concentrates ttention on those things that can be measured. On some things, for example, comfort, the pinion of the testing officers may for the time being play a part, but engineering studies are slowly reducing the guess work even in these fields.

Although the tests conducted at other centres permit and, in effect, expect the companies to submit a selected and prepared sample tractor for test, the objective in the Australian test is to work on a sample of the stock model that has been taken at random from the run of production or stock. Such a tractor is presumed to be representative of all the tractors of that make and model currently being offered for sale, such as any buyer might buy.

Report of Test

The full technical report of the test, in its several sections, attempts to describe the tractor and its response to the checks, measures and tests put on it, and to describe them in such a way that the information is complete in itself, with no loose ends that are doubtful or uncertain.

For example, as the British test code says, no drawbar results can have any meaning unless they are clearly related to the weight of the tractor in the tests, not only total weight, but front and rear axle weights also, and for that matter the height of the drawbar.

Likewise it is not sensible to give any power values for the engine without naming each time the engine speed.

For these reasons, and so that the company's and other technical officers, including extension officers and research workers, can get full sense out of the results, the reports are at some length and in some detail. For the farmer, the physical properties and the summary of results may be sufficient.

On the power tests, the report gives a table of results for full power on the engine, the p.t.o., the belt, and the drawbar. For the rest, including the intermediate values, the story is told in two series of graphs, one set for the engine itself as the source of power, and another set for the drawbar tests.

From these, any professional reader will get a complete picture of the tractor's total performance; from them he can make what comparisons and judgments he pleases.

The last section of the report is devoted to a fairly thorough specification of the main features of the tractor, the statement being supplied by the manufacturer. Nevertheless, the testing officers will have checked most of these details (at any rate those that are observable from the outside) because, of all people, the testing officers must be sure that the tractor they have tested is the tractor described in the specification.

For the farmer reader the report is also issued in a shortened form, with all the description as it affects the operation of the tractor, and with a useful summary of the results, but with much less tabular and graphical detail.

Whereas some hundreds of the Technical Report are issued to trade, professional and overseas bodies, some thousands of the Farmers' Edition are distributed for issue to farmers, if they want them, all over Australia.

Certificate

A tractor that has gone through the tests, and for which a report has been issued, may well be called a certified tractor. To bring this point home, to both users and prospective users of the tractor, a certificate is issued to the company saying that a stock model of this tractor has been tested, quoting the test number and the date, over the testing officer's signature.

This certificate is in the form of a transfer to be affixed to every tractor of the model in stock, so that the certificate may fairly be said to be attached to the tractor.

Interpretation of Test

There is no difficulty in interpreting the results on the engine: there is its full power output that drives everything else in the tractor; there are its torque and fuel consumption, at all speeds and loads, especially of course maximum power at the defined rated speed.

Likewise there is no difficulty about p.t.o. and belt power values; the tests show what the user can expect on p.t.o. drive and on belt drive from a typical tractor of this model; not that a difference of 2 or 3 h.p. one way or the other makes a lot of difference; no user is able, except rarely, to say what power he wants precisely for this job or that.

The physical properties of the tractor are described; these include—heights, lengths, weights, turning circles, p.t.o. and belt speeds, instruments and controls. They may suit him, or they may not, but there is not much room for argument about them.

It is only when we come to the drawbar tests and to the question, "What will this tractor do on my paddock, with my cultivator?" that difficulties of interpretation arise.

The difficulties are threefold:

(*a*) As a rule no one knows what pull is required to work that plough, or any other machine;

(*b*) No one can say how the tractor will perform on surfaces other than the test track;

(*c*) Both the pull required to work the plough, and the performance of the tractor's wheels will vary from soil to soil and, even on the one paddock, with the day to day and seasonal variations in the soil.

It is regretted that a lot more is not known about the pull, and the p.t.o. demand in some machines required to work the different classes and makes of machine on the different types of soil, or even on a standard soil, if there was such a thing.

It will be a very long time indeed before the soil engineers will be able to relate machine and tractor performance, even on the one soil type, to the differing conditions that can arise in a given soil; differences in the states of tilth (from pasture, through stubble, to rough cultivated land), and differences in the moisture conditions of the soil.

As to (*b*), one can say that, compared with the hard dry test track, a tractor in the field will deliver less pull, and will suffer more slip, and so will run at slower speed, and deliver perhaps a lot less power, even though the engine may be fully loaded. As the soil conditions get looser, rougher and/or wetter the difference between test performance and field performance gets worse.

It is perhaps possible to say that, for tractors of comparable weight and power capacities, the field performances are likely to be as much alike as the test performances are, but at some unspecifiable lower value.

It is hoped that, in due course, even this awkward question can be answered: but the answer is not yet in sight.

(*To be continued*)

BEET NEMATODE

The beet nematode, an important pest of beetroot, turnips, cabbages and related crops was recently found in Queensland for the first time (see this issue p.495). When the presence of this pest is suspected, samples of crop roots and surrounding soil should be forwarded to the Department of Agriculture and Stock, either in Brisbane, or the nearest country centre.

Queensland Fauna Sanctuaries

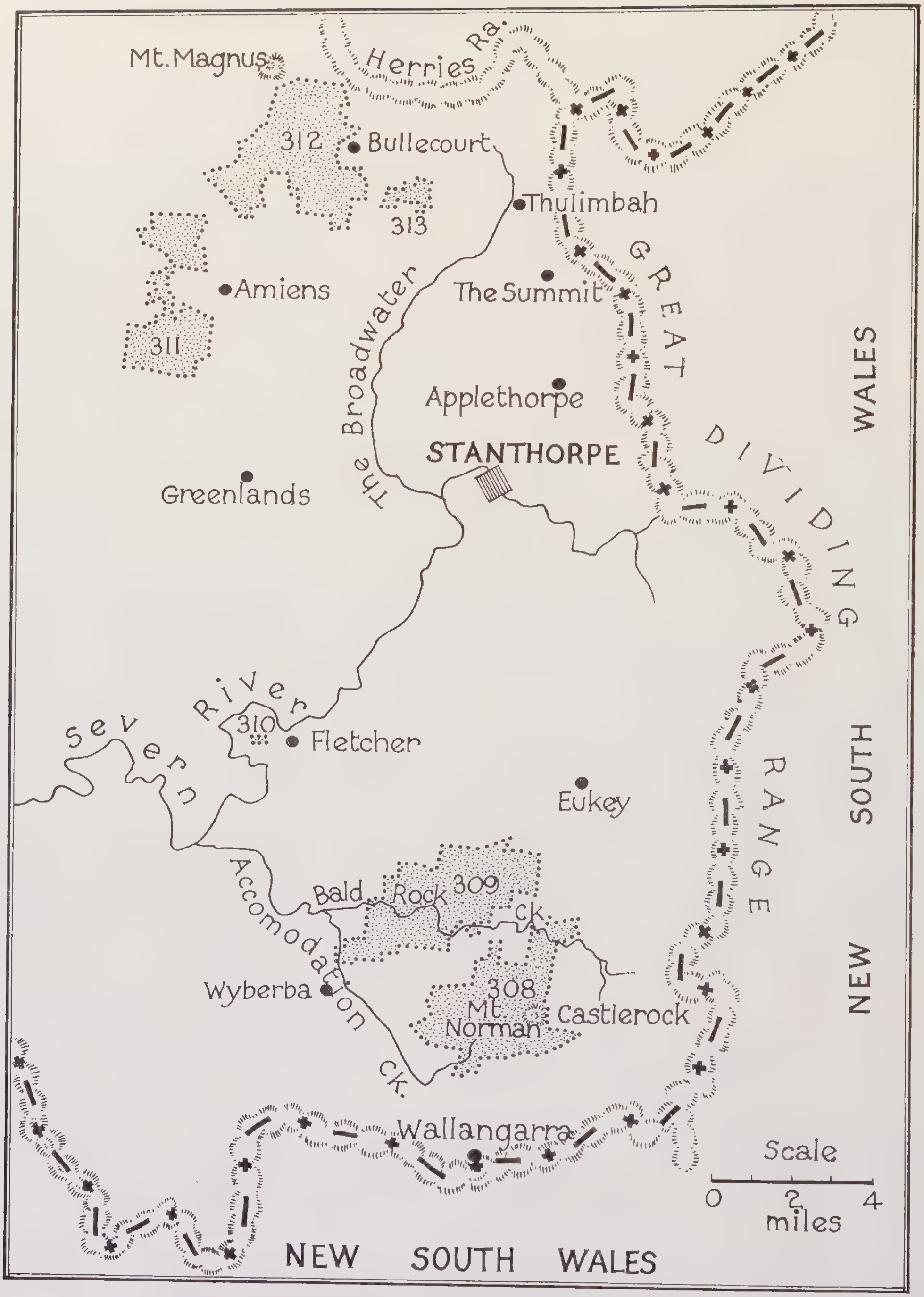
By C. ROFF, Fauna Officer.

Plate 11: **Bald Rock Creek, Part of Bald Rock National Park, via Wyberba.**

[*J. Smith (Manly) photo.*

The following is an index of the sanctuaries outlined in Map 23:—

Index No.	Sanctuary	Area in Acres
308	"Castle Rock" National Park Reserves 282 and 301, Parish of Tenterfield, via Wyberba	6,783
309	"Bald Rock" National Park Reserves 281, 295, 302 and 304, Parishes of Tenterfield and Broadwater, via Wyberba	5,821
310	"Mount Pleasant," via Fletcher	24
311	State Forest Reserve 316, Parish of Pikedale, via Amiens	3,800
312	State Forest Reserve 263, Parishes of Pikedale and Herries, via Bullecourt	6,035
313	State Forest Reserve 321, Parish of Marsh, via Pozieres	450


Mt. Magnus
Herries Ra.
312
Bullecourt
313
Thulimbah
Amiens
311
The Broadwater
The Summit
GREAT DIVIDING RANGE
Applethorpe
STANTHORPE
Greenlands
WALES
SOUTH
NEW
Severn River
310
Fletcher
Eukey
Accomodation Ck.
Bald Rock Ck.
309
308
Mt Norman
Castlerock
Wyberba
Wallangarra
Scale
0 2 4
miles
NEW SOUTH WALES

Map 23: **Map Showing Sanctuaries in Part of Fauna District No. 1.** The sanctuary boundaries, as at December 31, 1957, are delineated by dotted lines enclosing the stippled areas.

Family Room

Winter has been with us for some time, and e shorter days and longer evenings have rought the family together for longer periods.

Not many homes have more than one warmed oom, and some families finding that one room o small are planning to have more space before ext winter.

Here are some of the things which need to be onsidered when planning a family room.

To be a success the room must meet the needs f the family, both as a group and as individuals.

To ensure this the hobbies and interests of ach member of the family should be listed, nd the activities which the family pursue as a roup.

This list will give an idea of storage and floor nd table space required.

It is a good idea, too, to look ahead and hazard guess at what new hobbies and interests may evelop—particularly with a growing-up family.

Some questions which the family needs to nswer include:—

How much room do we need?

Does it want to be large enough for ping-pong?

Do we want it close to the kitchen for convenient serving of supper and snacks?

How will we heat it?

What do we want on the floor? Are we likely o want to dance there anytime? If so what ind of rug will we have for warmth?

What will be the best storage for our needs?

Do we want a room for rest and relaxation r for activity, or both?

What will be the best lighting to ensure everyone can see well?

All Australian-Made

A Stone, Navy and White Shirt and Stone Skirt That Was Featured in the Parade of Australian Fashions in London. All the garments paraded were made of Australian fabrics manufactured from Australian wool.

Do we need to plan for a T.V. set, or for film or slide projection?

Could one corner double as a sewing room?

How many power points will we need?

Will we want to make a fireside "cuppa" on the spot?

What will be the best kind of furniture for our needs? (Take time to look around for this and other needs.)

When you know the answers to these questions, and the others that will come to mind, definite planning of the family room can commence.

Keep Surfaces New

Homemakers' disappointment in the appearance of a piece of new equipment has sometimes been traced to wrong cleaning methods.

This is a pity because the correct method of cleaning the new finishes on to-day's household equipment is so much easier than some of the wrong methods used.

The right way is usually as simple as wiping over with a damp cloth and then, perhaps, a dry one.

The wrong way usually includes the use of some kind of abrasive cleaner, and once the very smooth, dirt-resistant finish is so treated the surface is damaged and all kinds of trouble may result.

Homemakers would be rewarded by following the advice about cleaning and the cleaner to use.

This advice is usually included in the general instruction booklet or on the tag.

New Cleaners

In addition it is well worth while to take the trouble to keep up with the new cleaners which appear as a result of the development of new materials and finishes. But a word of warning—check on the label to see if the cleaner is recommended for the particular finish, and if so follow the instructions faithfully.

Table Surfaces

Laminated plastics and self-adhesive plastic sheeting are both very easy to keep clean, but chopping or cutting will scratch a laminated plastic surface and destroy a self-adhesive plastic.

For ordinary cleaning, a mild soapless detergent and water is all that is necessary for either.

Rinse carefully, and wipe with a dry cloth to avoid smears.

Use a little undiluted soapless detergent for bad marks.

Anodized aluminium is often used for easy-to-clean trolley tops and trays. When it requires more than the ordinary wipe-over, be careful to use a non-alkaline detergent.

Melamine Tableware

The hard, shiny finish of melamine tableware must not be destroyed with scratchy cleansers, but thorough washing is essential to prevent permanent staining.

Non-scratch cleansers are available, or you can use an oxygen bleach or a soap powder containing one; a little of this rubbed on to a tea stain in a cup will remove the stain.

Kitchen Cabinets

Wipe kitchen cabinets over regularly with a damp cloth, using a mild soapless detergent to remove marks.

Dry with a soft duster to avoid smeary marks.

A sparing and occasional application of furniture cream helps to protect the surface.

Grooves for sliding doors on kitchen cabinets should be kept free from dust and crumbs; use the dusting nozzle of a vacuum cleaner for this job.

Her Job is Promoting Wool

Miss Nan Sanders, who is a Queenslander by birth, and one of the leading textile promotion experts in Australia, has spearheaded a successful drive for a greater use for wool. She is Promotion Director of the Australian Wool Bureau.

Colours For Children's Clothes

We're all familiar with the signals "red for stop" and "green for go", interpreting them as red for danger and green for all clear.

As red is the strongest of the "advancing" group of colours it is easy to understand why it was selected as the danger colour—we see it sooner than other colours.

Making practical use of this "hit you in the eye" characteristic of some colours is gaining wide favour among mothers, reports Miss Nancy Foskett, Senior Extension Officer, Women's Services, N.S.W. Department of Agriculture.

American mothers have been urged to dress their children—particularly the younger ones who have little sense of danger—in red and other strong colours.

Bright colours—red, butter yellow, bright royal blue, crimson—that are in strong contrast to the surroundings, are recommended.

These provide a margin of safety, that extra fraction of a second's warning that spells the difference between life and death when a child runs, unthinking, on to the road or in front of the tractor, after a pet puppy or a lost ball.

An added advantage of brightness in children's clothing is that children are easier to find if they wander away or are lost at bush picnics or on the beach.

Americans are using colours for safety in many other ways too.

For example, tests by American railroad companies show that there is safety in colour combinations of orange and black, or orange and royal blue for train exteriors.

These ensure year round visibility in any part of the country and have reduced the risk of level crossing accidents.

Latest development overseas in the use of colour for safety is the recommendation that aircraft be painted fluorescent orange to reduce the risk of collision by making them easier to see in bad weather.

You Must Sort Washing

Unsatisfactory results from mechanical washing in modern washing machines may be caused by careless—or no—sorting of the clothes and articles.

Modern washers do a fine job for the homemaker, particularly in reducing fatigue, but they cannot produce a good coloured wash if we toss in a collection of unsorted clothing and articles, press a few buttons and go on our way.

There is as great a need, however, to sort clothes for the washing machine as for the washtub and copper.

Sort according to:

- Type of fabric.
- Colour of fabric.
- Temperature of water.
- Washing time.
- Degree and type of soil.
- Type of article.

This latter classification is not usually included in washing instructions, but some might like table and kitchen linen washed separately, and don't like pillow cases and socks washed together.

In the pre-synthetic age we sorted into three or four bundles—wool, silk, cotton and linen, and sometimes mixtures. Today we have synthetics and drip-dries to consider, which also call for different handling.

Irrespective of the tremendous improvements in dyeing it is still worth while not to wash whites and coloureds together.

Worth remembering, too, is that fresh water for dark colours can be a time-saver as any fluff and dirt in "used" water will spoil the appearance of dark colours.

This still varies according to fibres and colours.

Start off with cool and add hot, or vice-versa, according to next load if not a fully automatic washer.

This varies according to delicacy of fabric and amount of soil.

Where a load is made up of equally soiled articles, but some are more delicate than others, stop the machine and remove the delicate articles before the time for the heavier articles is up.

Any stains should be removed before washing, while soaking or a longer wash-period will look after many soiled articles.

Very soiled articles are better washed in two separate waters rather than twice as long in the one water.

Close zippers; check for brooches, pins and tears; empty pockets; and tie any strings in a loose knot.

Rubber Floors

Rubber floor-covering is attractive and durable, clean, and quiet underfoot. It is easy to care for, but the methods used differ from those applied to other types of floor-covering.

After the rubber is laid, clean the surface with a damp cloth.

Never wash until adhesive is thoroughly set—four or five days after flooring material is laid.

(Rubber is slippery when wet and to prevent accidents any liquids spilt on rubber floors should be wiped up immediately.)

To remove ordinary dust and dirt use a vacuum cleaner, or a soft floor brush or non-oily dry mop.

Do not use oil mop or oily sweeping compounds.

To retain that glossy appearance, polish frequently with a clean, soft cloth.

To remove mud and soil, wipe with a mop wrung out in clear, cool water.

For occasional thorough cleaning, wash with an approved rubber-flooring cleaner in preference to soap and detergents.

Strong soaps dry out asphalt, cork, rubber, and linoleum, making them brittle, porous, and hard to clean.

Rinse with clean water. When dry, polish thoroughly.

For an extra-high shine, apply a thin coat of water-base, self-polishing wax. Polish and apply a second thin coat of wax.

Polish thoroughly.

Unless the floor gets a great deal of wear, it should be waxed only occasionally.

If wax is allowed to build up on the surface, i will make the floor dingy-looking.

Always use a water-base wax on rubber, never a naptha-base wax.

Naptha, a solvent, softens and pits the rubber and causes colours to "bleed."

Do not apply varnish, lacquer, shellac or similar products—they cause rubber to dry out crack and curl.

Regular polishing is the best care you can give a rubber floor.

A floor that receives a fair amount of traffic will benefit from an occasional buffing with No. 00 steel wool.

Leather Likes Care

Leather responds readily to regular care, and rewards the owner not only through more attractive appearance but also by lasting longer.

This is true whether it be a handbag, shoes brief case, leggings, belts, upholstery or luggage

Some reminders for regular care:

- As with any other article, do not allow leathergoods to become too soiled or dull before cleaning.
- Dust with brush or cloth before applying polish.
- Use a good polish or cream *sparingly*.
- Use a colour nearest that of the leather.
- A neutral, or colourless polish is an advantage for shoes and essential for upholstery, handbags and belts. When the use of a coloured polish is necessary to restore colour to those articles always give a final polish with a colourless polish to prevent marks on clothing.
- For navy-blue leather-goods, which tend to lighten in colour, use black polish occasionally—but sparingly.
- A final rub with a silicone-treated cloth imparts a protective film which makes continued repolishing unnecessary.

When a build-up of polish occurs and it i difficult to raise a shine, wipe the article lightly with a cloth dampened with methylated spirits.

As this will tend to dry the leather, rub in some colourless shoe cream before polishing.

Grease spots are difficult to remove but this method is usually effective:

First, moisten the leather surface with water, using a pad of absorbent cotton or a small sponge.

With another sponge or wad of cotton, apply a solution of oxalic acid evenly over the soiled surface. The solution consists of 1 part oxalic acid powder or crystals to 10 parts water.

After the spots are removed with the solution apply saddle soap to the leather and polish with a soft chamois.

There is now a silicone spray on the market which will impart a waterproofing film over the article.

It is recommended for the soles of footwear as well as the uppers and the instructions are to respray weekly, depending on wear.

Buying Knitwear

One of the best guides to quality in knitwear is the way parts are shaped and joined, seam treatment, the finish of the neck and any openings; in two words—good workmanship.

Here are some ways of checking workmanship before buying knitwear:

There are two methods used for shaping—the cut-and-sewn and the full-fashioned—and sometimes both are used on the one garment.

Until recently the full-fashioned method had not been used on other than the more expensive garments; the finest and most costly sweaters and cardigans are full-fashioned throughout.

The different parts are knitted on flat machines that shape and bind-off the edges as they knit.

Full-fashioned shaping may be detected by fashion marks (similar to those on the back of a stocking) about the armholes, sleeve sides, and sometimes the neck.

Stitches that look like fashion marks but are for appearance only are sometimes found on cut-and-sewn garments.

Genuine fashion marks are indicated if the rows of knit stitches come together at an angle; in imitation "full-fashion" the rows are parallel.

Cut-and-sewn garments are cut from a flat piece of knit yardage just as garments are cut from woven fabric.

It is a less costly method and is used for less expensive articles.

If carefully cut and stitched, as in high-grade articles, the cut-and-sewn garment will hang, set, and wear well.

But if care has not been exercised in the laying out of knit yardage, placing pattern pieces, and cutting, the garment will sag and twist in the same way as a fabric garment will sag and twist if cut off-grain.

To see whether the necessary care has been taken, follow the ribs and courses of stitches.

This is more difficult on finer knits, but is worthwhile.

Careless cutting may show up anywhere in a garment so check the back, front and both sleeves.

Guide To Quality

Here are some ways of checking the workmanship of seams and joinings and seam coverings:

Serviceability and appearance of a garment are both affected by the way the parts are put together.

Full-fashioned garment seams are made by looping or overlocking, both of which are satisfactory. Looping looks like hand seaming, the edges being machine-stitched together close to the already bound-off edges.

A single ply of the garment yarn is used and the seam is fine, soft, flat, elastic and comfortable.

In overlocking, the pieces are joined with a stitch that looks like buttonhole stitch used in hand-sewing.

A single-ply is suitable if the garment yarn is used and the finished seam is small and durable, but overlocking is more noticeable and not as flat or flexible as a looped seam.

Cut-and-sewn pieces must be stitched securely and covered to prevent cut edges ravelling.

The edges are stitched and covered at the same time, making what is called a merrowed seam.

This looks much like an overlocked seam, but because of the row of stitching it is stiffer and less elastic, and more noticeable, especially if cotton thread is used for the row of stitching.

A well-made merrowed seam is one in which the covering stitches are close together.

Poorly-finished seams, where stitches may be so far apart that the raw edges come through between them, have little stretch and so the thread snaps easily.

Seam ends should be closely examined for secure fastening off.

Seam coverings are often used on the shoulder and back-of-neck seams of cut-and-sewn garments.

They prevent seams stretching out of shape and protect stitching against wear.

If straight tape is used, it should be eased on; other methods are to use a strip of knitted fabric or an overlocked stitch.

In good quality garments, neck and other bands are seamed to the garment by looping, which gives a smart, neat and elastic join.

In cheaper grade articles, overlocked seams are generally used.

These are stiff and bulky, and unless the edges are stretched as they are sewn, the stitching breaks.

Checking The Finish

Neck finish is important, as there is much strain at this point, and if the garment is stretched out of shape its appearance is spoilt.

A neck finish may be single-looped or double-looped.

A single-looped finish has one thickness of ribbing and a double-looped finish two thicknesses, the ribbing being double, with the fold on the neck edge.

The double-looped finish has less stretch but keeps a better shape.

In either case, look for a smooth, neat finish and check the stretch at the join and edge.

An elastic thread run through the edge will help hold the shape.

If the band is made separately, make sure it has been sewn on straight with the rib, or grain, of the body; check the method of finishing for smoothness, good appearance and firmness.

The band should be faced to ensure that it wears well and holds its shape.

Ribbon facing, most often used, is a neat and strong reinforcement for buttons and buttonholes, but may fade or shrink.

A knitted facing matches the garment and will react to washing in the same way as the whole garment, but it is more bulky than ribbon facing.

Make sure the band is firmly reinforced and that buttonholes are evenly spaced and the same distance from the edge of the garment.

The cut should be parallel with the grain of the knitted fabric and its reinforcement, which should be wider than the length of the buttonhole.

Buttonhole stitches should be deep enough to prevent their pulling out and close enough to cover cut edges, otherwise the buttonhole will stretch and tear, and soon look untidy.

Vertical buttonholes are not completely satisfactory on close-fitting garments as they do not stay fastened as well as horizontal ones.

Buttons should be washable, firmly stitched on, with no loose threads, and should be a satisfactory colour.

—New South Wales Department of Agriculture's "Press Notes."

Botany For Farmers

Although compiled in the first place for beekeepers, "The Honey Flora of South-Eastern Queensland" has a use for farmers and others interested in botany. It contains illustrations and descriptions of the important ironbarks, gums, bloodwoods, boxes, stringybarks, wattles, tea-trees, and cultivated plants such as lucerne, pumpkins, oranges and clover.

"The Honey Flora of South-Eastern Queensland" contains 199 pages and 178 illustrations. Prices are: In Queensland 15s. a copy, with a 3s. discount to registered apiarists, University botany students and booksellers; elsewhere £1 a copy.

Beat Mat Grass With Pasture Renovation

Compiled from a report by N. E. GOODCHILD,
Senior Adviser in Agriculture.

Carpet or mat grass (*Axonopus affinis*) is fast becoming a major enemy of the rich dairy pastures on scrub lands along the Queensland coast. An Agriculture Department study on methods of controlling this pest is giving an encouraging verdict.

The mat grass problem is growing, and each year more farmers are faced with the need to attack it.

Silently creeping into old-established paspalum and kikuyu pastures, carpet grass soon takes over and dominates the sward. Its spread is helped by the fact that it is unpalatable. Stock seek out he sweeter grasses and over-graze them, leaving he carpet grass to spread unchecked.

The nutritional value of carpet grass is low nd its invasion of dairy pastures is always folowed by a drop in milk yields.

Its appearance in a sward is generally a sign f deteriorating pastures, and overstocking could e a contributing factor. It appears that after razing has continued for about 30 years, carpet rass will invade and suppress paspalum and ikuyu pastures on coastal scrub soils.

As time goes on, land use in Queensland will ecome more intensive, and the pastures, of ourse, will grow older. It is, therefore, increasngly necessary to maintain their vitality.

Ripping and Fertilizing

All the evidence so far points to ripping and ertilizing as the best practical means of restoring cover of good quality pasture to the land. In trials, this two-stage method has given encouraging control of carpet grass.

Early in 1958, trials aimed at controlling carpet grass were commenced. Four acres infested with carpet grass were selected on a farm at Dalrymple Heights in the Mackay district. This land was deep red scrub soil originally carrying satin ash or Eungella gum. It had been under a paspalum and kikuyu pasture for about 30 years, but, at the time of the trial, was heavily over-run with carpet grass.

Early in January 1958, the plot was grazed heavily and then ripped to a depth of 4 in. The renovation was carried out with Ferguson tillers. Late in the same month the trial area, divided into four one-acre plots, was given the following fertilizer treatment: Plot 1 was left unfertilized as a comparison. Plot 2 was fertilized with a nitrogen-rich fertilizer (10 : 10 : 0) at 1 bag to the acre. Plots 3 and 4 were given 2 and 4 bags respectively of the same mixture. The whole area was then over-sown with 2 lb. of white clover and 2 lb. of red clover to the acre. Three inches of rain fell soon after sowing.

The response was rapid and vigorous. By May, within four months of treatment, the paspalum and kikuyu were growing vigorously in all the plots. Height and density of the sward reflected the amount of fertilizer applied: in the plots given the heaviest fertilizing the grass was highest and the sward thickest.

In all plots the stand of carpet grass was greatly reduced.

Plate 1

Renovated and Fertilized Pasture Shows this Response.

But clover growth was poor and restricted, due to the heavy smothering by the dense cover of paspalum and kikuyu. The clover failed to recover from this bad start.

Follow-up Fertilizer

The year following treatment was unusually wet—the rainfall for 1958 was 150 in. Observations made in February, 1959, indicated that the nitrates were depleted, probably leached out during the heavy and prolonged wet season. This suggests that follow-up fertilizer treatments would be required for permanent control of carpet grass.

Encouraged by the initial success, the treatments were repeated in February, 1960. Observations in the first two years of the trial suggested that further ripping and fertilizing would gi greater control over the carpet grass.

The value of this trial is not restricted to th Mackay district. The carpet grass problem growing in most coastal districts where improve pastures have been down for about 30 years. Th method used at Mackay could have a definit place in carpet grass control on the Atherto Tableland and in coastal districts of souther Queensland.

As another attack on the carpet grass problem a new trial is to be laid down on the same property later this year. In this an attempt will b made to use molasses grass to smother the carpe grass.

Maize Trials At Kairi

By J. van der LIST, Experimentalist.

Recent trials showed little difference between the yielding ability of Durum and Atherton Dent strains of maize on the Atherton Tableland.

Due to increased plantings of pasture and peanuts in recent years, the acreage of maize on the Atherton Tableland has declined somewhat from the estimated 24,000 acres that were planted annually to this crop.

Experiments have been carried out over the past seven years at the Kairi Regional Experiment Station to evaluate the relative merits of the two main types of maize planted on the tableland. These types are known locally as Atherton Dent and Durum.

Atherton Dent is an open-pollinated yellow dent maize, which originated from crossings made in the early days between the maize strains that best suited the soil and climate of the area.

The characteristics of this type are maintained by end of each season selection of seed for the next planting. It follows, therefore, that Atherton Dent is really a collective name for a number of strains, selected and maintained by individual farmers.

The Durum type originated by crossing hard flint maize with yellow dent. This strain shows only a slight crease in the otherwise rounded and smooth top of the grain.

Hybrid maize has been used commercially on a small scale in recent years. This hybrid maize was developed in the South but tested under local conditions.

In the experiment at the Station, three Atherton Dent strains and three Durum strains were tested each year in a 6 x 4 randomized block experiment. Unfortunately, only four strains were available for use over the whole period of 7 years. The other two had to be replaced by other strains of the same type of maize, and for this reason these figures have been omitted from the yields shown in Table 1.

The experiment was carried out on scrub soil, that is, soil derived from basaltic parent material under tropical rain forest conditions, which is similar to many areas cropped to maize in this district.

It must be stated here, however, that the experiment was located on soil that has been less eroded than the average district farm. It was located on the same site during the years 1953-54-55 but was shifted to a neighbouring paddock for the remainder of the period.

In the following table the average yield figures are tabulated for each of the four strains grown throughout, figures being presented as bushels per acre:—

TABLE 1

Strain of Maize	Year					
	1954	1955	1956	1957	1958	1959
Durum—						
Kairi R. E. S. ..	57·6	48·7	..	67·6	31·5	56·1
Kattenberg V. ..	63·5	58·9	..	82·3	33·9	56·7
Atherton Dent—						
McGeehan-Pensini	52·6	52·1	..	84·2	32·7	54·7
Brown	51·8	54·2	..	75·8	31·9	49·6
	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.
Average plant spacing	0 22	0 16	..	0 13	0 15	0 13
Row spacing ..	3 8	3 8	..	3 8	3 8	3 8

The trials were initiated in 1953, but crops failed that year following an outbreak of a severe virus disease.

During 1956, the crop lodged on account of cyclonic winds to such an extent that no reliable figures could be obtained.

Statistical analysis of the results revealed that differences due to season were highly significant and it was shown that the 1958 results were significantly lower than those obtained in other years.

A relatively late planting (23-12-58), coupled with a dry spell at tasselling, and poor filling out of the grain, were the causes of diminished yields in this season.

For the last three years, statistical analysis of the yearly results has also been carried out. Significant differences have shown up between strains, but have not been consistent over the years.

Allowing for the two strains that were changed during the period, it was found that the average yield of Durum during the period 1954-59 was 55·2 bus. per acre, whereas the average yield of Dent during the same period was 53·7 bus. per acre.

Average yield figures indicate the Kattenberg V. Durum and McGeehan-Pensini Dent were the better strains in their respective groups.

However, there are other factors which favour the Durum strains, and this tendency has been apparent during each season. The figures in Table 2 indicate the average of the two strains in each group over the 1954-59 period.

TABLE 2

Strain	Barren Plants	Nubbins	Lodging	Partly Diseased Cobs	Totally Diseased Cobs
	%	%	%	%	%
Durum group	6·4	7·5	8·8	9	3
Dent group ..	7·6	8·0	10·6	12	4

While these factors all favour the Durum strains, they are offset by the fact that the Dent group produced more grain per grain-bearing plant—·368 lb. against ·341 lb. Dent grain,

Plate 1

Crop of Atherton Dent Maize Grown on the Atherton Tableland.

moreover, is more easily attacked by weevils tha the harder Durum grain. This is important whe harvesting delays occur.

In practice, it is easier to obtain an even stan with dent grain on account of the larger see size. Experiments have shown that even stand are required for high yields and well graded maiz of even size is better to handle through the con ventional planter.

Hybrids. Trials have been carried out durin the last three years with promising hybrids o the dent type. Some of these have outyielded tha local open pollinated strains by more than 15 pe cent. However, all these hybrids were suscep tible to ear rots.

These experiments have shown that there is n significant difference in the yielding ability o Durum and Atherton Dent strains. It is likely, however, that, in the future, hybrid maize wil replace the local open pollinated strains to a greater extent.

Register Of Merit For Dairy Cows

By E. B. RICE, Director of Dairying.

The requirements for the entry of cows into he Register of Merit for dairy cows have been ltered to bring them into line with Queensland nvironmental conditions. The amended rules, which have been agreed upon by the Dairy Cattle Breed Societies in Queensland, became effective on July 1, 1960.

The object of the Register of Merit for dairy ows is to provide a permanent record of high-producing strains of dairy cattle. The Register will be open to any qualified cow which has been ecorded under the Pure Bred Dairy Cattle Production Recording Scheme, or the Herd Production Improvement Scheme.

All qualifying records made under the Pure Bred Dairy Cattle Production Recording Scheme will be automatically accepted. For records made under the Herd Production Improvement Scheme t will be necessary for the owner to apply for cceptance, which will be given only if the cow s identifiable to the satisfaction of the Director of Dairying, and has been sired by a registered pure bred bull or a bull eligible for registration.

Sections of Register

The Register will be divided into three sections:

Intermediate section
Lifetime section
Elite section.

Intermediate Section. A cow shall qualify for egistration in the intermediate section if, in three uccessive lactations with not more than 15 months between consecutive calving dates, she produces at least—

(*a*) 950 lb. butterfat if her first qualifying lactation is commenced before she is 2 years and 183 days old;

(*b*) 1,000 lb. butterfat if her first qualifying lactation is commenced between 2 years 182 days and 3 years and 183 days old;

(*c*) 1,050 lb. butterfat if her first qualifying lactation is commenced after she is 3 years 182 days old.

The production of each lactation shall be based on the first 270 days from the commencement of recording.

Lifetime Section. A cow which has produced a minimum of 2,240 lb. of butterfat in not more than eight lactations shall qualify for registration in the lifetime section.

Elite Section. A cow which has produced a minimum of 3,600 lb. of butterfat in not more than 10 lactation periods shall qualify for registration in the elite section.

Details Recorded

The Register shall contain the following information:—

(*a*) The name of the owner;

(*b*) The name and herd book number of the cow;

(*c*) The name and herd book number of the sire;

(*d*) The date of calving prior to the commencement of each qualifying lactation in the case of the intermediate section;

(*e*) The pounds of milk, butterfat percentage and pounds of butterfat for each lactation in the case of the Intermediate section;

(*f*) In the case of the Lifetime and Elite Sections, the date of commencement of the first and last lactations, the total yield of milk and butterfat, the average butterfat test of the milk, and the number of lactations.

A certificate giving these particulars will be issued to the owner of the cow.

Records produced after the issue of a certificate shall be added on application to the Director of Dairying, Department of Agriculture and Stock, Brisbane.

Merit Stud Register for Dairy Herds

A Merit Stud Register has been inaugurated in order to indicate to dairy farmers the stud dairy herds in which a high percentage of the cows is entered in the Register of Merit for Dairy Cows.

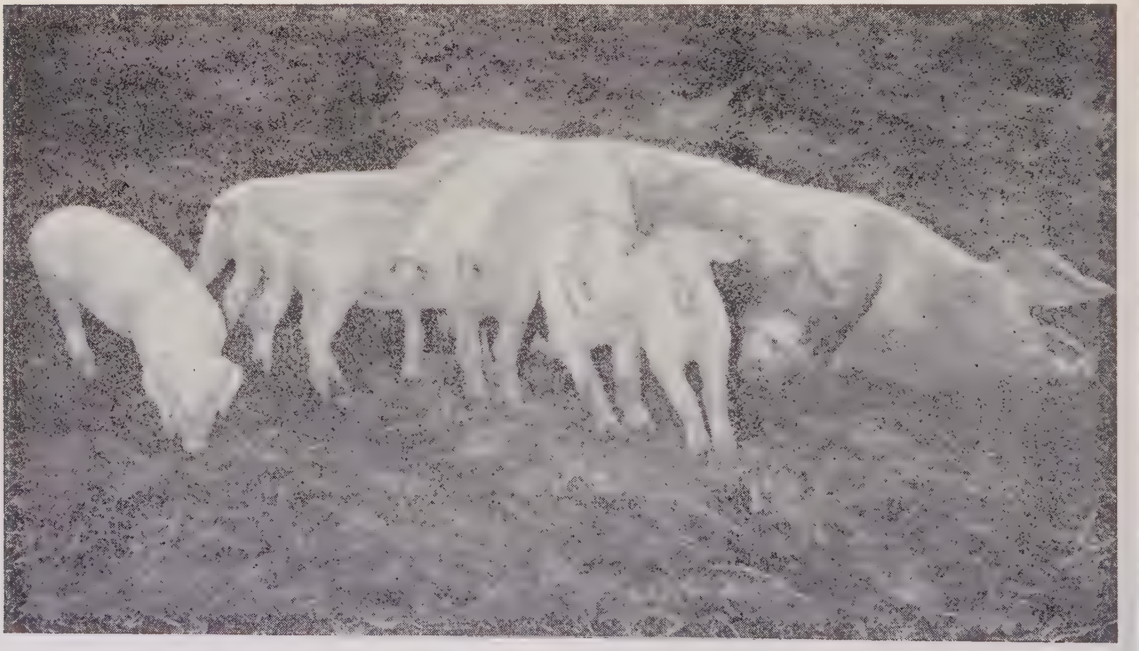
The following conditions apply:

(1) Any owner of a herd which is recorde under the Pure Bred Dairy Cattle Pro duction Recording Scheme may appl for registration of his herd in the Mer Stud Register.

(2) In the year for which application made for registration in the Stud Mer Register at least 40 per cent. of th cows not less than four years old i a herd (with a minimum of six cows shall be entered in the Register of Mer for Dairy cows.

(3) A herd shall be registered in the Stu Merit Register for one year only. Fres application must be made yearly fo renewal of registration. For the pu pose of the scheme the year shall b from July 1 to June 30.

Landrace Family at "Glenroy"



A Landrace Sow With Her Litter at "Glenroy" Stud Piggery, on the Darling Downs. The property, owned by Mr. W. F. Kajewski and Son, consists of 500 acres, of which 250 acres are under cultivation and 50 acres under improved pastures of lucerne, clover and grasses. The pigs, in addition to being grass fed, are given a mixture of grain, wheatmeal and minerals. The property also runs 100 pure bred A.I.S. cattle.

Tomato Diseases And How To Control Them

By J. C. JOHNSON and J. E. C. ABERDEEN. *

The tomato plant is subject to attack by a large number of diseases, many of which may cause substantial losses to growers if adequate precautions are not taken to deal with them. Preventive measures should be adopted as far as possible, because they are generally cheaper and more satisfactory than control measures applied to crops which are already infected. The programme of disease prevention and control should be planned well in advance of the planting of the crop, since it involves consideration of the following matters:

(1) The purchase of disease-free seed.

(2) The planting of only those varieties which possess some degree of resistance to Fusarium wilt.

(3) The careful establishment of the seedbed.

(4) The choice of the position of the field planting, only after consideration of a suitable rotation.

(5) Ensuring that adequate supplies of fungicides and insecticides are ready for immediate application.

(6) Ensuring that the spray apparatus is working efficiently.

KEY TO IDENTIFICATION

The following key should help in the identification of the major tomato diseases, apart from nutritional disorders. Any determination of a disease made by using this key, however, must be checked by referring to the detailed descriptions of the symptoms given later under the heading of that disease. If the disease does not appear to correspond with any of those described, further advice should be obtained from the Department of Agriculture and Stock.

In the Seedbed:

1. Seedling stem shrivels at ground level, and falls to the ground .... **Damping-off.**
2. Stem shows a dark-brown to black spot near soil level; growing tip often purplish in colour .... **Target Spot.**
3. Leaves show small, dark spots.......... **Target Spot, Bacterial Spot,** or **Septoria Leaf Spot.**
4. Leaves and stem show relatively large dark, rotted areas.......... **Irish Blight.**
5. Entire seedling stunted and purplish; no disease apparent on leaves, stem, or roots .... **Faulty Nutrition** or **Virus Disease.**
6. Seedling stunted; growing tip producing thickened distorted leaves; stem shows a characteristic bronze-green colour and reduced number of hairs **Tomato Mite.**

In the Field:

1. Entire plant wilted—
   - (a) Wilting very rapid—sometimes in a few hours —suggesting plant severed from root system; no yellow leaves. Stem at soil level may or may not show a light-brown discolouration of woody tissues .... **Bacterial Wilt.**
   - (b) Wilting very slow—sometimes takes weeks; older leaves show distinct yellow colour; affected leaves break off easily from stem. Stem and leafstalks show light-brown to dark-brown streaks under bark in hard, woody tissue **Fusarium Wilt** (in summer), or **Verticillium Wilt** (in winter).
   - (c) Some stems show splitting and rotting of internal tissue with mealy appearance; affected leaves do not break away from stem readily; leaflets on one side of leaf usually affected first (see also fruit symptoms).......... **Bacterial Canker** or **Pith Rot.**

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* Mr. Johnson is a Plant Pathologist with the Department of Agriculture and Stock, and Dr. Aberdeen, formerly Plant Pathologist with the Department, is now Senior Lecturer in Botany at the University of Queensland.

2. Entire plant stunted—
   - (a) New growth slow, spindly, leaves crinkled and pale green, poor fruit set .... **Leaf Shrivel.**
   - (b) Bronze markings on young leaves; these curved downwards more than normally .... **Spotted** or **Bronze Wilt.**
   - (c) Young leaves show light and green markings and tendency to crinkle .... **Mosaic.**
   - (d) Young shoots swollen and distorted, with last-formed flower buds standing erect; purplish colouration throughout tips .... **Big Bud.**
   - (e) Young leaves malformed, with leaflets very spindly and fernlike .... **Fern Leaf.**
   - (f) Young shoots show intense purplish colouration **Faulty Nutrition, Excessively Cold Temperature, Virus Disease, Irish Blight,** or **Target Spot** (attacking stem).

3. Leaves and stems—
   - (a) Small spots about ⅛ in. in diameter, with grey centres and small black pin-point dots. Leaves at base usually affected first .... **Septoria Leaf Spot.**
   - (b) Dark-brown spots, up to ½ in. in diameter—sometimes larger on stem—with sharp margins and often with concentric ringed appearance. Basal leaves usually affected first. By far the commonest leaf spot .... **Target Spot.**
   - (c) Large, dark-brown lesions often involving entire leaflet. These have the appearance of a wet rot in humid weather but are papery if atmosphere is dry. May show first on any part of plant **Irish Blight.**
   - (d) Lesions uniformly small, rarely greater than ⅛ in. in diameter, dark-brown in colour .... **Bacterial Canker** or **Bacterial Spot.**
   - (e) One leaf, or part thereof, shows decided wilt (see also fruit symtoms) .... **Bacterial Canker.**
   - (f) Older leaves yellow without any obvious spotting; with or without wilting of tips .... **Fusarium Wilt.**
   - (g) Large yellow indefinite lesions on upper surface of leaf, accompanied by a characteristic velvety dark layer of fungus under leaf. Only severe in wet northern regions of Queensland .... **Leaf Mould.**

4. Fruit—
   - (a) Dark, sunken spot present on flower end of fruit .... **Blossom-end Rot.**
   - (b) Mottled, brown markings covering large proportion of fruit surface; spread very rapidly (see also leaf and stem symptoms) .... **Irish Blight.**
   - (c) Very dark spots, sunken and velvety, commonly up to ¾ in. in diameter, usually originating from stalk attachment, growth-cracks or other injury **Target Spot** and other **Alternaria Rots.**
   - (d) As for (c) but not dark or velvety, surface c spots pimply .... **Phoma Rot**
   - (e) Small spots 1/16 to ⅛ in. in diameter, usuall with light halo around margin .... **Bacterial Canker**
   - (f) Small spots 1/16 to ⅛ in. in diameter, ofte raised and scab-like; no halo .... **Bacterial Spo**
   - (g) Large tough white spot on side facing sun .... **Sunburn**
   - (h) Blotchy ripening .... **Mosaic,** or other **Virus Disease, Shade Spot,** o other **Physiological Disorder**
   - (i) Fruits generally dwarfed, mis-shapen and har **Virus**
   - (j) Fruit completely broken down by watery ro **Bacterial** or **Fungous Rot** following insect c other injury
   - (k) Blossom end of fruit mis-shapen .... **Catface**

TARGET SPOT

Target spot is very common both in the seedbeds and on the plants in the field. The seedlings do not always show obvious symptoms, a they may be attacked only on the stem at groun level and exhibit merely a hard, stunted appearance. A period of warm, moist weather following infection may soon cause the death of suc infected plants. If the infection is unnotice and the seedlings are planted out into the fiel the stem lesion usually develops to a dry shrunke area, which may cause retardation of the growt of the transplants and result in a girdling the stem leading to death of the affected plants or leave the plants so weakened that they readil snap in the wind. This symptom is usuall known as "collar rot". A plant may recover if it has been transplanted sufficiently deeply, b developing new roots above the target spot lesion

Leaves, stems, and friut may be affected o plants in the field, but the older leaves usuall show the symptoms first. Dark-brown spots commonly ⅛ to ¼ in. in diameter but up to ½ i under favourable conditions and with definit margins, are produced on leaves and stems These spots may be marked by the concentri rings (Plate 1) from which the common nam of the disease is derived. They may also have yellow margin.

The fruit lesions are in the form of black t dark-brown oval to round spots, which usuall occur immediately on the edge of the stem sca

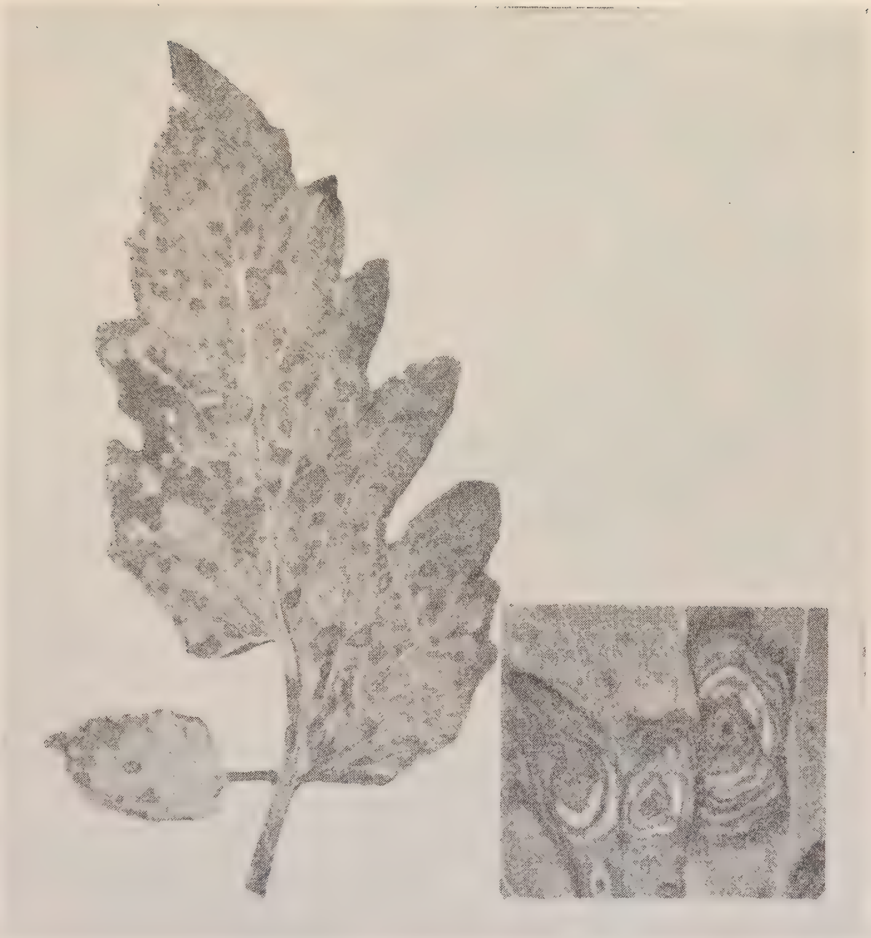

Plate 1

Target Spot on Foliage. Inset shows concentric rings more highly magnified.

(Plate 2) but may be also scattered about the fruit. In the former case, they may often be associated with a growth-crack, but at other times the disease appears to have attacked the fruit stalk first and subsequently entered the fruit. The fungus does not grow readily in green fruit, so that a mature green fruit which is nfected, although not showing any spots when forwarded to the market, may develop the disease as it commences to colour.

This disease is caused by one particular fungus (*Alternaria solani*), but when causing fruit rots t may have associated with it several closely-elated fungi which help to extend the damage. All of these fungi are far more resistant to dry weather conditions than is the fungus causing Irish blight, and they appear to require very little moisture and wind movement for their development and spread. Also, the target spot fungus prefers warm temperatures, so that in south-eastern Queensland the autumn and spring are the seasons most likely to provide conditions favourable to epidemics, though the disease may be present to some extent throughout the year.

Observations indicate that the disease advances more rapidly when the plant is carrying its maximum load of fruit, and that if plants are backward in any way they are more readily attacked.

The available evidence suggests that the target spot fungus is readily carried over in the soil from season to season.

Target spot is present throughout all the tomato-growing areas of Queensland, and

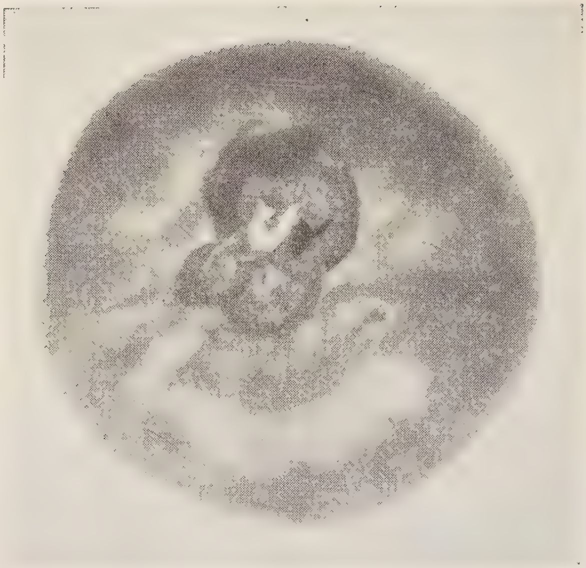

Plate 2

Target Spot on Fruit.

probably causes a greater aggregate loss than any other tomato disease. The slower and less spectacular spread than in Irish blight results in greater neglect by the growers and treatment is often commenced too late to do any appreciable good.

Control

Zineb is the most efficient fungicide available for the control of this disease. Both spray and dust preparations are available. Zineb has largely replaced copper preparations because of its greater effectiveness and lower toxicity to the plants. It is however less persistent than copper preparations and should be applied more regularly, that is, at 7 to 10 day intervals.

Copper preparations have the advantage that they give more lasting protection, and that they are more effective against diseases other than target spot which are likely to be present also. The choice of which type of fungicide should be used therefore rests with the grower.

The usual copper spray strength for field use is that given by 4-2-40 Bordeaux mixture; commercial copper compounds should be used at the strength recommended on the label. With a crop like tomatoes, where rapid growth necessitates frequent applications of the fungicide in order to maintain a covering on the growing tips it is very likely that a weaker strength of Bordeaux would exercise economic control. In considering dusts, however, it is not recommended that anything less than a strength of 7 per cent. copper should be used, to be increased to 10 per cent. if conditions are favourable to the spread of the disease.

Great care should be exercised in the selection of the seedbed site. It should be in an open sunny position in soil not recently used for tomatoes. It should also be high enough to ensure that surface water from nearby sources of infection will not reach it. Plants should be raised in rows and well spaced to permit air circulation and effective spray application. The plants should not be held in the bed longer than necessary if early signs of the disease are present. Less trouble should be experienced with direct seeding in the field.

Sprays should be reduced to half strength when used in the seedbed and not applied within two days of transplanting, as the loss in transplanting may be increased considerably if conditions are dry at the time. If collar rot is regularly causing trouble in the seedbeds, a solution at the same strength as for application to the plant may be watered directly on the surface of the soil after planting the seed.

(See section at end on a combined spray for tomatoes.)

IRISH BLIGHT

The first evidence of the presence of Irish blight is usually in the form of extensive dark-brown to black lesions on the stems and leaves (Plate 3). In moist weather the leaf lesions have the appearance of a wet rot and may even show a white downy growth on the lower surfaces of the leaves, but when dry conditions prevail the lesions are dry and papery. The fruit is readily attacked in all stages of development, a large mottled-brown lesion with indefinite margins usually covering at least one-fourth of the fruit surface being produced (Plate 4). A minor symptom of Irish blight is an intense purple dis oloration of an individual stem, apparently due interference with the food supply to that stem aused by girdling.

Irish blight is caused by a fungus (*Phytophthora festans*) which grows very readily in cool, moist eather. The disease appears only in the cooler onths, during which time it may become pidemic only when favoured by continued howery conditions and overcast skies. Heavy ews also favour its spread. Extremely rapid evelopment of the disease is brought about by succession of sharp, cold snaps, as the causal ngus, under these conditions, can reproduce self even more rapidly than when the weather is niformly cool and moist. If the temperature rises ppreciably, or dry weather appears, the spread f the disease ceases immediately. Because ueensland winters are normally dry, epidemics f Irish blight are not common in this State.

It is also likely that most present-day varieties ossess some resistance to this disease. This ould in part contribute to the fact that few serious utbreaks have occurred over the past 10 years.

Control

Irish blight can be controlled by the use of copper sprays or dusts. If there is any likelihood that the disease will develop, or, as the first symptoms are detected, a copper spray schedule should be adopted, and continued for as long as climatic conditions favourable to the spread of the disease persist. Normally, the interval between applications is 7 to 10 days. This period may need to be shortened if climatic conditions are unusually favourable to the development of Irish blight, whereas during prolonged dry spells it may be increased. As for target spot, it is not advisable to reduce the strength of a dust below 7 per cent. copper. Sprays weaker than the standard 4-2-40 Bordeaux mixture could possibly be used, but thoroughness of application must never be neglected.

It must be noted that tomatoes may be packed in apparently good condition and develop the symptoms of Irish blight while in transit to, or on, the market. Hence, if the grower has Irish blight in his crop it is advisable for him to hold the fruit for three or four days before packing.

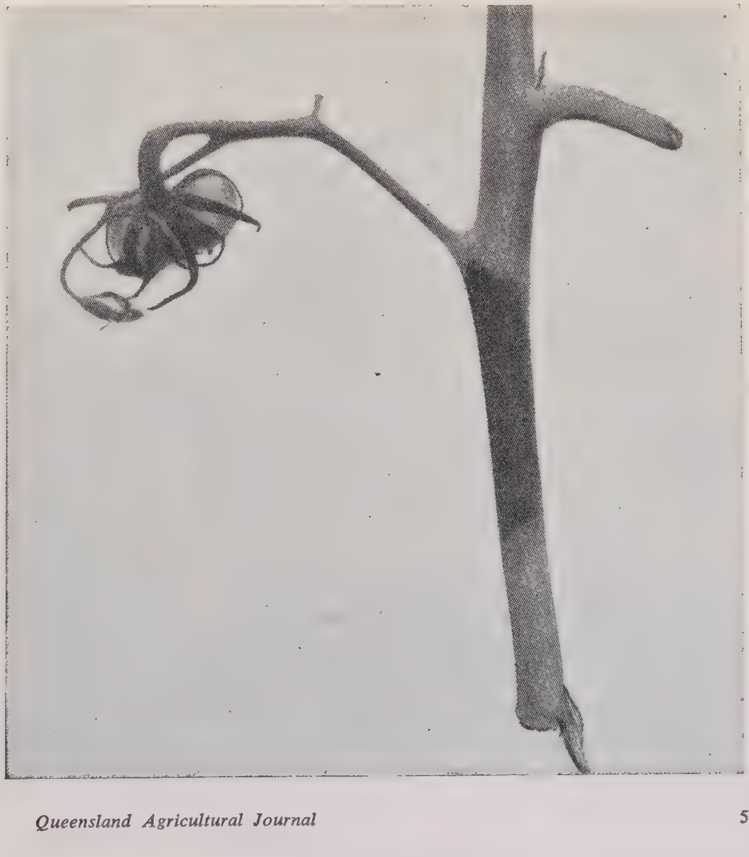

Plate 3

Irish Blight on Stem.

Plate 4

Irish Blight on Fruit.

SEPTORIA LEAF SPOT

The fungus (*Septoria lycopersici*) which causes Septoria leaf spot produces small brown spots about $\frac{1}{8}$ in. in diameter, scattered over the lower leaves of the plant. While the margins of the spots remain brown, the centre develops a light-grey colour and is characteristically studded with a number of small black pin-points which are the tops of the minute, flask-shaped spore receptacles belonging to the fungus (Plate 5). The lesions are usually much smaller than those of target spot, but the early stages could readily be confused with bacterial spot. Yellowing of the leaf takes place around the spots and gradually spreads until the leaf dries out and withers. The lower leaves are killed from the bottom of the plant up, and a scalding of the fruit thus exposed to the sun may result.

Septoria leaf spot occurs in all of Queensland's tomato-growing areas, but is not nearly so important as target spot. The disease is most serious in the warmer months of the year. Both zineb and copper fungicides are effective. (See the section at end on a combined spray for tomatoes.)

Treatments should be applied as a protecti measure. Little benefit will be obtained by spra ing after the plants are well infected with t disease.

LEAF MOULD

Leaf mould is likely to occur seriously only the very high rainfall districts of Queensland. chacteristic symptom is the premature death the older leaves, leaving the plant with a ragge appearance somewhat similar to the result defoliation by target spot. Another characterist is the appearance on the lower surface of the le of a velvety dark growth, which is the caus fungus. In the earlier stages of the attack t leaves show indefinite yellow lesions on the to surface. Infection of the fruit is unusual, but t blossoms may be attacked and destroyed.

The disease is caused by a fungus (*Clad sporium fulvum*) and the essential factor for i spread is a very high humidity. While the disea has been recorded as far south as Brisbane, it is regular occurrence only in northern parts of t State. Here leaf mould often surpasses targ spot in importance. While the disease is prese in most other countries, it is usually troubleso only in glasshouses.

Control

Within glasshouses great stress is laid on t importance of controlling temperature a humidity. That is to say, temperature should kept below 70 deg. F. and relative humidity belo 70 per cent., and ample ventilation should provided. Control of these conditions in a fie crop is usually out of the question. However, will be seen that areas well protected from win are the most likely to be affected, as high relati humidities develop more readily in still atmo pheres. The breeding of tomatoes resistant leaf mould has been successful in some areas, b owing to the different strains of fungus no o variety is successful everywhere. Manalucie one of the most useful yet released in Queenslan

Salicylanilide sprays at a strength of 1½ pin of 25 per cent. solution in 40 gal. of water ha been reasonably successful in controlling th disease.

BACTERIAL SPOT

The bacterium (*Xanthomonas vesicatoria* responsible for bacterial spot disease attacks th leaves, stems and fruits. On the leaves (Plate 6

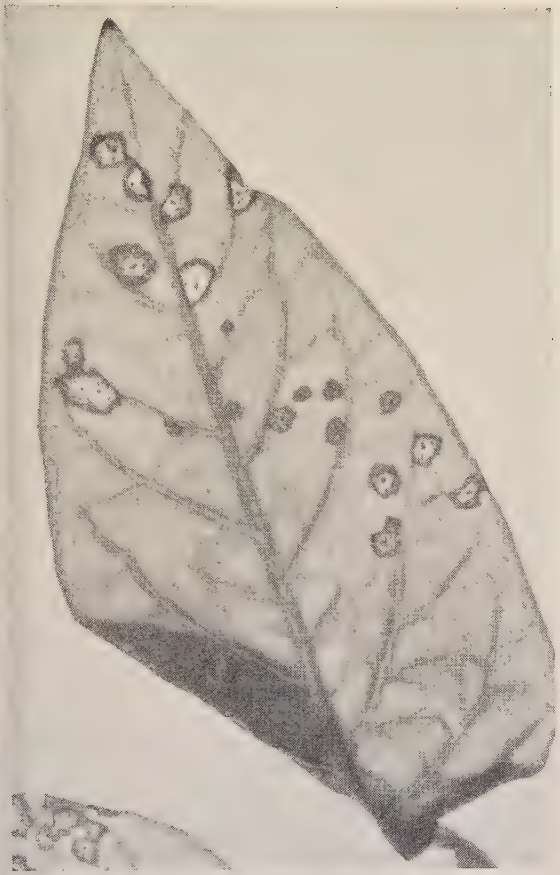

Plate 5

Septoria Leaf Spot on Leaf.

and stems (Plate 7) the disease appears as small dark spots similar to the early stages of Septoria leaf spot and target spot. They are differentiated from Septoria leaf spot in that they do not develop the grey centres and pin-point fruiting bodies, and from target spot in that they remain comparatively small and do not develop concentric rings. Also, if the bacterial spots are examined from the lower surface of the leaf, it will be found that many of them have a greasy appearance. In addition to attacking leaves and stems, the disease forms small dark greasy spots on the flower hands which cause a considerable loss due to flower drop.

On the fruit, bacterial spot appears as a small black raised scab-like spot (Plate 8) which may increase in size to approximately $\frac{1}{8}$ in. in diameter. When approaching the maximum size, however, the centres become slightly sunken. If the spotting is severe a number of spots will sometimes coalesce, forming a more extensive area. The size of the individual spot depends on the amount of growth that the fruit makes after it is infected, and does not increase after the fruit has matured. The fruit cannot be infected after a certain stage of maturity has been reached, which appears to correspond with the disappearance of the hairs from the fruit.

The fruit spot does not penetrate past the tissue immediately under the skin and if extensive rotting occurs it is due to other organisms entering the bacterial spot injury. No new spots develop in storage or in transit.

The variety Grosse Lisse and the various selections from it exhibit a high resistance to the fruit spot phase of the disease. The leaves and stems, however, are often affected. Sioux, Red Cloud, Rouge de Marmande and Break-O-Day are highly susceptible to the fruit spot.

Late summer and autumn appear to be the most favourable periods for development of this disease, probably because rain is the main factor in its spread. Wind-blown rain followed by drizzly overcast weather creates ideal conditions but these periods are normally of brief duration.

The disease is widespread throughout the older tomato-growing areas.

Control

The main sources of infection with bacterial spot appear to be in the seed and in the soil. Seed contamination is usually confined to the outside of the seed, so routine treatment with corrosive sublimate or one of the mercurial seed dressings is recommended. The general precautions in selection and treatment of the seedbed, as discussed later, are also recommended.

There is evidence that the application of a copper spray checks bacterial spot. This idea is supported by the increased severity of the disease in some cases where copper has been replaced by zineb in the spray programme. If the disease is well established, it would be wise to grow only a Grosse Lisse type.

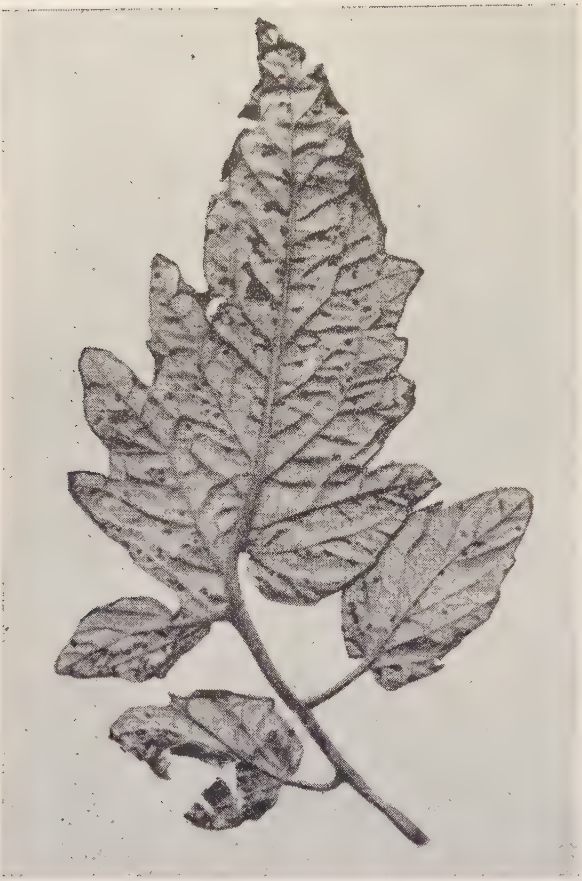

Plate 6
Bacterial Spot on Foliage.

PHOMA ROT

The disease Phoma rot was first recorded in Queensland in 1926, and though usually regarded as being of minor importance, it may become a serious problem to tomato growers during seasons of high rainfall. Under such conditions it may prove to be the most serious cause of fruit wastage, both in the field and during transit to the market. The causal agent is the fungus *Phoma destructive* Plowr., which is a wound parasite gaining entry through injuries present on the surface of the fruit.

On the fruit, infection occurs frequently at the stem end, where it causes sunken lesions not unlike those caused by target spot. In this case the fungus enters through the stem scar. Fruit showing ring or star cracking is particularly susceptible, while roughly handled or hail damage fruit may become infected on all surfaces (Plat 9). It is this last type of infection which cause the greatest amount of transit loss, since th others are more often encountered at the tim of harvesting, when they are rejected.

The small circular spots as they first appear o the ripening fruit are usually somewhat depresse and show little discolouration of the underlyin tissue. A close examination of the larger lesions especially when held towards the light, will revea the presence of numerous minute erupting spore producing bodies in the centre of the diseased area

The pimpled appearance which this gives t the lesions is a distinguishing feature and on from which the older name of pimply rot wa derived. The infected tissue usually later become dark and sunken, but this is not always the case for under certain conditions large infected area may occur and be neither sunken nor dark. Th pimply appearance is, however, a constant featur of the disease. The invaded tissues remain quit firm unless invaded by other soft rot organisms

The fungus is able to grow and produce a abundance of spores on dead tomato leaves whic often accumulate under older plants. In period of exceptionally high rainfall, the leaves, le stalks and stems of the growing plants may als be attacked, and large dark lesions showing concentric ring markings are produced. These symptoms are again very similar to those produced b target spot.

Control

The amount of fruit wastage in the crop depend largely upon what precautions are taken righ through the growing period. Residues from previous crops should be destroyed by raking an burning, or by some other means. Seedbeds should not be located near packing sheds or wher diseased and discarded fruit from previous crops have been allowed to accumulate. The regula application of a fungicide such as zineb or coppe will also serve as a form of protection. Where dead leaves accumulate under the plants, the fungus is able to build up a reservoir of infection from which the spores are conveyed to the fruit and these should therefore be removed where possible. This practice should not prove difficul in staked or trellised crops.

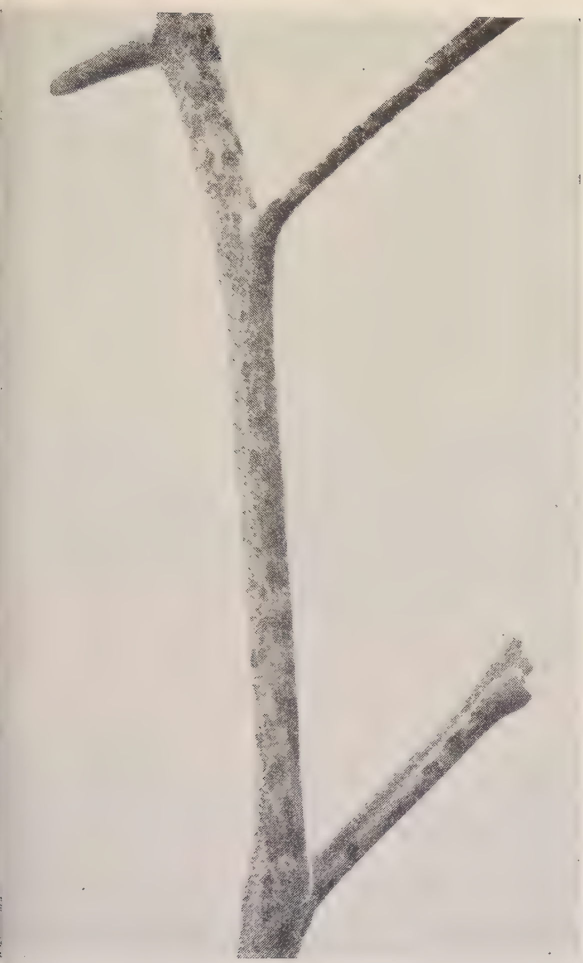

Plate 7
Bacterial Spot on Stem.

Since infection takes place through skin wounds on the fruit, care should be taken to ensure minimum injury during harvesting and packing operations. This should include careful inspection of picking tins, packing benches and graders for likely causes of fruit injury, and the use of protective felt or soft sacking surfaces wherever possible. After harvesting, fruit should be kept in a dry place until it can be marketed.

FUSARIUM WILT

The first indication that a plant is infected with Fusarium wilt is given by a cessation of growth. The next symptom is provided by the leaves, for those near the base of the plant commence to turn yellow and die. Then, a week to a month later, according to whether temperatures are high or moderate, the entire plant becomes wilted. Sometimes the infected plant does not die but remains in a stunted state for several months.

Leaves on a diseased plant readily break away from the stem, and, if the stem surface is scraped off the plant just above the ground level, brown streaks will be seen in the woody water-conducting tissue (Plate 10). In severe cases the dark streaks extend around the entire stem, so that if the stem is cut across with a sharp knife a dark ring shows up just inside the bark. A further characteristic feature is that often only one branch of the plant is infected. If this happens when the growing period is entering the cooler part of the year, the plants may produce a number of healthy branches and a payable crop still be harvested.

This disease is caused by a fungus (*Fusarium oxysporum* f. *lycopersici*) which penetrates the roots and grows up through the water-conducting vessels of the stems and leaf stalks. The fungus also occasionally grows from the stem into the developing fruit and infects the seed.

It is introduced to a farm with the seed or by means of wind blown spores and carries over from season to season in the soil. It may be spread by soil washing across lower slopes, by ploughs or other implements, or by moving the residue of an infected crop on to an uninfested area.

This disease requires warm temperatures (with an optimum of 80 to 90 deg. F.) for its development and consequently only affects plants growing during the spring and summer months. Light-textured soils tend to produce a greater incidence than heavy soils, and an acid soil also accentuates the trouble. Severe outbreaks often follow waterlogging of the soil.

Fusarium wilt is present in practically every warm-temperate, subtropical and tropical tomato-growing area in the world. In Queensland it is still a limiting factor for warm weather crops, and any soil which has grown tomatoes for a number of years may be assumed to be infected with the Fusarium wilt organism.

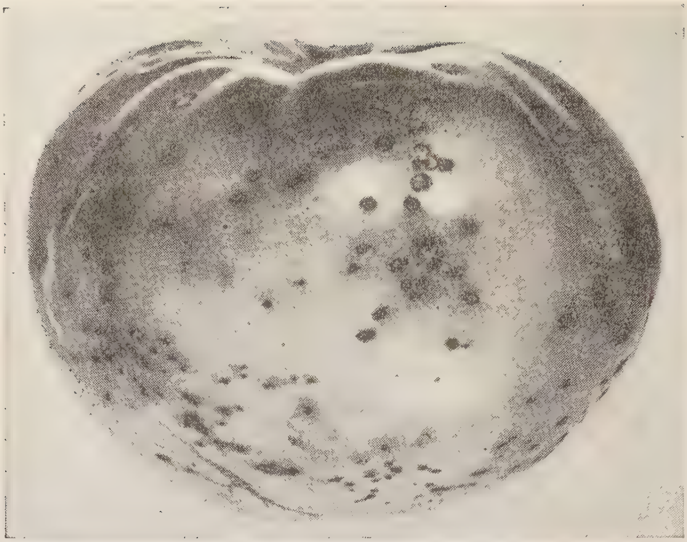

Plate 8

Bacterial Spot on Fruit.

Control

The main line of control for Fusarium wilt is to use resistant varieties. It should be understood, however, that the term "resistant" is really a relative one, and under conditions very favourable to wilt some of these varieties show a percentage of infection. Two outstanding varieties for resistance to this wilt are Manalucie and Kokomo. These two varieties have not been readily accepted by growers, however, probably because the fruit is smaller and less abundant than would be desirable. However, they are near-commercial types and can be recommended for trial in localities where wilt is generally severe.

Suitable so called "resistant" varieties are Grosse Lisse, Pearson, Red Cloud, Valiant and Rutgers. The number of varieties with high resistance should increase considerably in the near future, as much breeding work is being done on this problem. Amoung the definitely susceptible varieties are Burwood Prize, Chalk's Early Jewel, Bonny Best, Rouge de Marmande, Earliwinner and Earliana.

VERTICILLIUM WILT

The symptoms of Verticillium wilt are very similar to those already described as characteristic of Fusarium wilt, both in the manner of wilting of the affected plants and in the discoloration of the water-conducting vessels. This disease, however, onl shows up in the winter and spring, and the older leaves of attacked plants tend to dry and wither without the preliminary yellowing which is characteristic of Fusarium wilt. There is also a tendency for the vascular darkening to occur only in the base of the stem The diagnosis is often further complicated by the fact that some Fusarium infections may carry over into winter following their initiation the previous autumn, so that both Fusarium and Verticillium infections are present in the same crop.

This disease is caused by a fungus (*Verticillium albo-atrum*). While the trouble is widely distributed it is of economic importance only in some of the southern districts where the winter crop is grown

Control

The only control measures which can be recommended for dealing with Verticillium wil are crop rotation and the use of healthy seed It must be assumed that the organism is present in the soils of most of the older tomato farms in and around Brisbane.

BACTERIAL WILT

The first symptom of bacterial wilt infection is a slight stunting of the attacked plant, but the symptom which is generally noticed is the spectacular collapse of what appears to be a vigorous, healthy plant (Plate 11). This collapse may be complete within 24 hours and may show no preliminary symptoms on the lower leaves In this respect it differs from Fusarium wilt. The water-conducting vessels under the bark are often discoloured, as in the latter disease, but when the stem of a bacterial wilt infected plant is cut across just above soil level a slimy ooze is often, but not always, apparent. It is never present in Fusarium wilt.

Bacterial wilt occurs in most tomato-growing countries and has been recorded from the majority of the tomato-growing areas in Queensland. It is only of economic importance to the late summer crops of tomatoes. The disease may

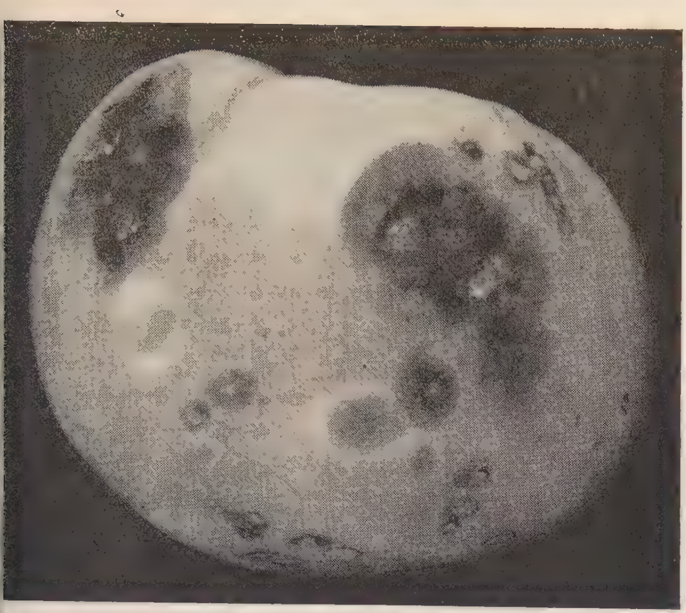

Plate 9

Phoma Rot. Transit rot produced by careless harvesting or packing. Note damaged skin of fruit.

also attack potatoes, eggplants, tobacco, dahlia, sunflower and zinnia, so the presence of these plants on a farm may favour its occurrence.

Bacterial wilt is caused by a bacterium (*Pseudomonas solanacearum*) and in this respect it differs from the two previously discussed wilts, both of which are the result of fungous infection. It appears, however, to be very localised in its occurrence; for example, in one large district only portions of individual farms are affected. The tendency is for the lower and moister portions of the properties to show the greatest incidence of the disease. The soil may receive its primary contamination from a crop of potatoes, or from seedlings of any of the susceptible plants brought in from infested soil, but it is possible that virgin soil may be infested. Like Fusarium wilt, this disease occurs mainly in warm weather, the most favourable soil temperature being approximately 75 deg. F. It is carried over from one season to another in the soil.

Control

It would appear that losses due to bacterial wilt will only be minimised by refraining from growing crops of tomatoes on infected soil during the warmer months of the year.

On a number of occasions it has been noted that a mulch of animal manure on the seedbed has been associated with heavy losses of transplants.

So far as resistant varieties are concerned, the only commercial variety that has shown any degree of resistance to bacterial wilt is Sioux. This variety has several disadvantages. It is susceptible to a disorder known as vascular browning, a darkening of the inner wall of the fruit, which at times causes heavy wastage, and the fruit has the reputation of not carrying well to the market.

BACTERIAL CANKER

As bacterial canker is very easily spread from plant to plant by handling, especially in pruning a trellised or staked crop, it is important to be able to recognize the early symptoms of the disease. In a young infected plant one leaf, or perhaps only the leaflets on one side of a leaf, droops and wilts, while the remainder of the plant looks quite normal and vigorous. Following this preliminary wilting, there appears a dieback of the growing tip (Plate 12) and this is accompanied by a splitting of the stem.

The wilting of the leaflets on one side of the leaf, mentioned for the young plant, is also characteristic of the disease in the older plant. If an affected leaf on such a plant is broken or cut off, a brown discoloration of the tissues can be observed on the exposed area of the stem. On peeling away the surface layer of the stem just over this discoloured portion, the tissues are seen to have a mealy appearance. This discoloration advances into the inner portion of the stems as the disease progresses. In the later stages of the disease the stems of an affected plant may split and produce the cankers from which its name is derived.

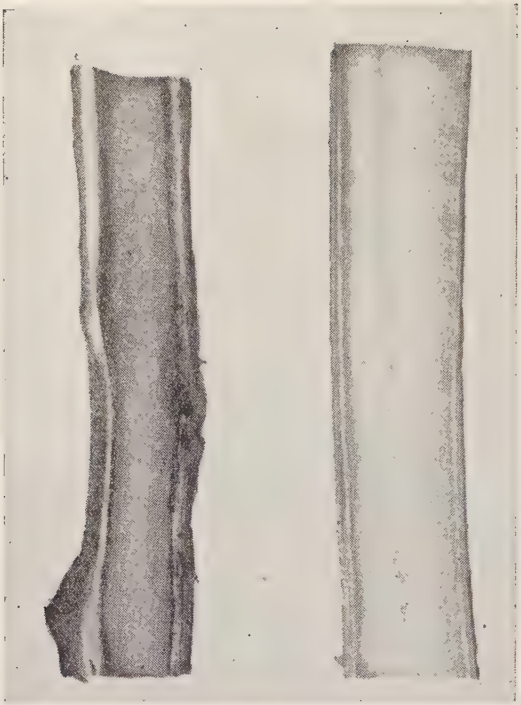

Plate 10

Fusarium Wilt. In the affected stem on the left the brown streaks in the woody water-conducting tissue are evident.

The leaf spots are usually round and very small, and not particularly characteristic, but the fruit spots generally have a white margin with a split in the centre and are therefore more characteristic and are suggestive of another name sometimes given to this trouble—bird's-eye spot (Plate 13). The spots are rarely over ⅛ in. in diameter, and are not raised as is often the case with bacterial spot.

Several other tomato diseases display symptoms which are similar to those produced by bacterial canker; for example, one-sided wilt of the early stages of bacterial canker occurs at times in bacterial wilt and may also be caused by a stem-boring caterpillar. In addition to bacterial wilt, bacterial canker may be confused with Fusarium wilt. However, there is usually some distinguishing characteristic by which the diseases may be separated; for example, the golden yellow discoloration of Fusarium wilt is not found in bacterial canker, and the lower leaves do not break off so easily as is the case when Fusarium wilt is the cause of the trouble. Again, the mealy discoloration of the internal tissues of the stem which occurs in bacterial canker extends right into the pith, whereas in the case of Fusarium wilt and bacterial wilt the discoloration is confined to the water-conducting tissue, which presents a woody appearance.

Bacterial canker, as the name implies, is caused by a bacterium (*Corynebacterium michiganense*). The disease develops most rapidly in the early autumn and spring months, but crops affected in the early autumn will readily carry the disease into the winter. The rate at

Plate 11

Bacterial Wilt. The collapse of the plant is shown.

which bacterial canker may spread in an affected crop is accelerated by the onset of rain, but it is not so strikingly dependent on rain as is bacterial spot.

Although the disease originally enters the crop through the medium of infected seed, its subsequent spread takes place either by the handling of the plants in pruning or other operations or, after the stems crack, by the splashing of the plants with bacteria in raindrops. Bacteria are present in large numbers in the stem cracks, and, if splashed on to the leaves and fruit by rain, extensive spotting will develop.

The only important tomato-growing area in Queensland from which bacterial canker has not been recorded is the Bowen district. This does not mean that it is not present there, however, because it could remain undetected for a considerable time in crops growing unpruned on the ground. So long as care is exercised in seed selection and treatment, it is unlikely that canker will affect a whole district to the extent that Irish blight may in a season which is favourable to its development. However, it can be disastrous for the individual grower, especially if he is trellising or staking the crop and has made several prunings before discovering the presence of the disease.

Control

One of the most essential points in dealing with this disease is to obtain, if at all possible, seed

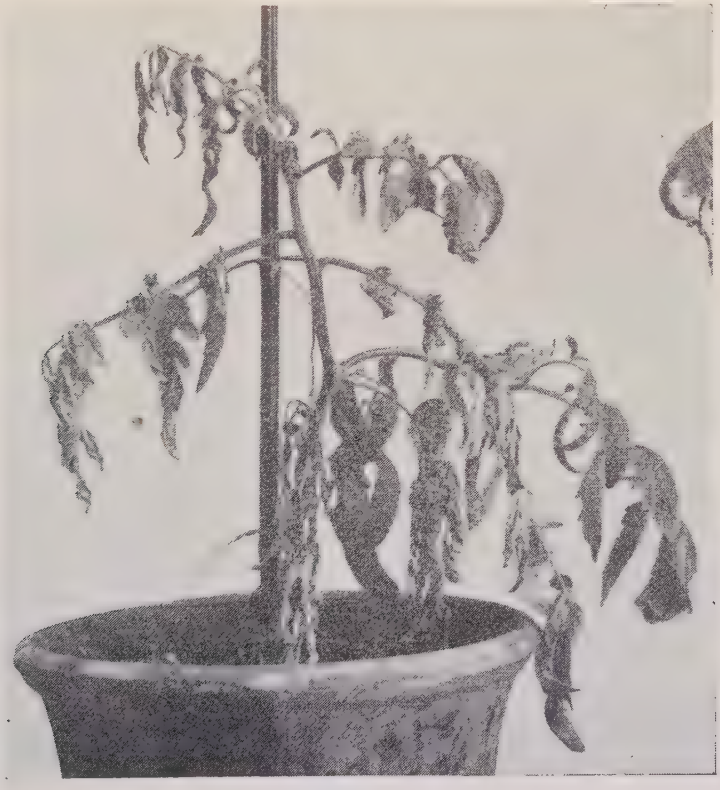

Plate 12

Bacterial Canker on Young Plant. Leaf on left shows wilting of leaflets on one side only.

from a disease-free source. A grower who saves his own seed should take special precautions against bacterial canker infection, one of the most important of which is to allow the seed and pulp to ferment for three to six days without adding any water. This process kills any bacterial organisms which may be present in the seed and in the pulp. However, as the type of fermentation may vary with different conditions, it is recommended that the seed be dried after cleaning and then treated in a corrosive sublimate solution according to the directions given later. Seed from an unknown source should also receive this treatment. Seed treatments with acetic acid and hot water may also be used. In spite of the seed treatments, however, the main emphasis must always be on disease-free seed.

Before the pruning of a tomato crop is commenced an experienced person should check through the crop and mark all plants suspected of being infected with bacterial canker. If more than 5 per cent. of the plants are so affected it is advisable to leave the crop unpruned on the ground, thus reducing handling to a minimum. The hands should be washed very thoroughly in soap and water after working with any diseased plants, and any material which will be used again next season (such as stakes) should be sprayed with 2 per cent. formalin and immediately covered with bags for several hours. None of the usual sprays exercises any appreciable degree of control of this disease.

In recent years when Grosse Lisse and its various selected types have been predominant in southern Queensland tomato-growing districts bacterial canker has been almost unknown. There is a strong possibility that this variety is somewhat resistant to the disease. The Daydream variety is known to be very susceptible.

SCLEROTINIA ROT

The fungus which causes *Sclerotinia rot* (*Sclerotinia sclerotiorum*) also causes a serious disease of beans, and to a lesser extent affects lettuce, cabbage, and celery. The most characteristic symptom is a light coloured rotting of the stem, which may be 1 ft. or more in length, usually causing the tops of the plant to wilt and die. Infection usually arises where a spent flower has lodged on the stem, or where the stem has been injured by rubbing against a stake or trellis wire. As the diseased tissue dries out, the black resting bodies (sclerotia) of the fungus begin to appear in number both on the inside and (though less often) on the outside surface. These bodies vary in size from ⅛ to ½ in. in length and are irregular in shape. They fall to the ground in due course and serve to carry the disease over to the next winter. When suitable winter weather reoccurs, the sclerotia give rise to small cream mushroom-like bodies on the soil surface, ⅛ to ¼ in. across, which release the spores of the disease into the atmosphere.

Control

The progress of the disease is closely determined by the amount of moisture in the air around the plants, being most severe following prolonged periods of wet or cloudy weather.

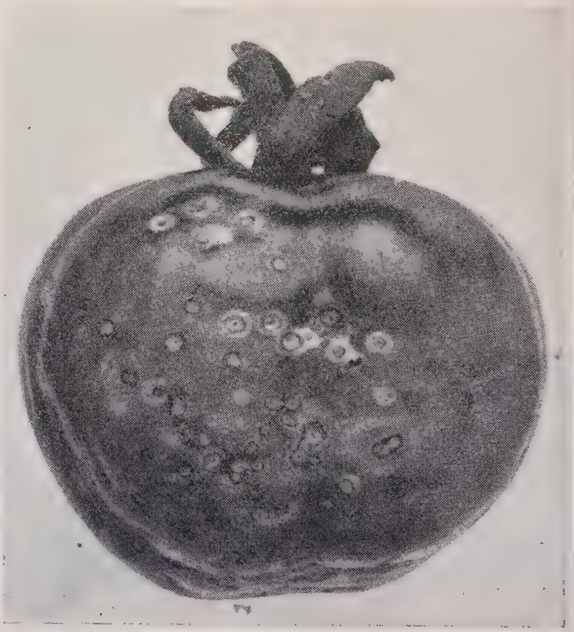

Plate 13

Bacterial Canker on Fruit.

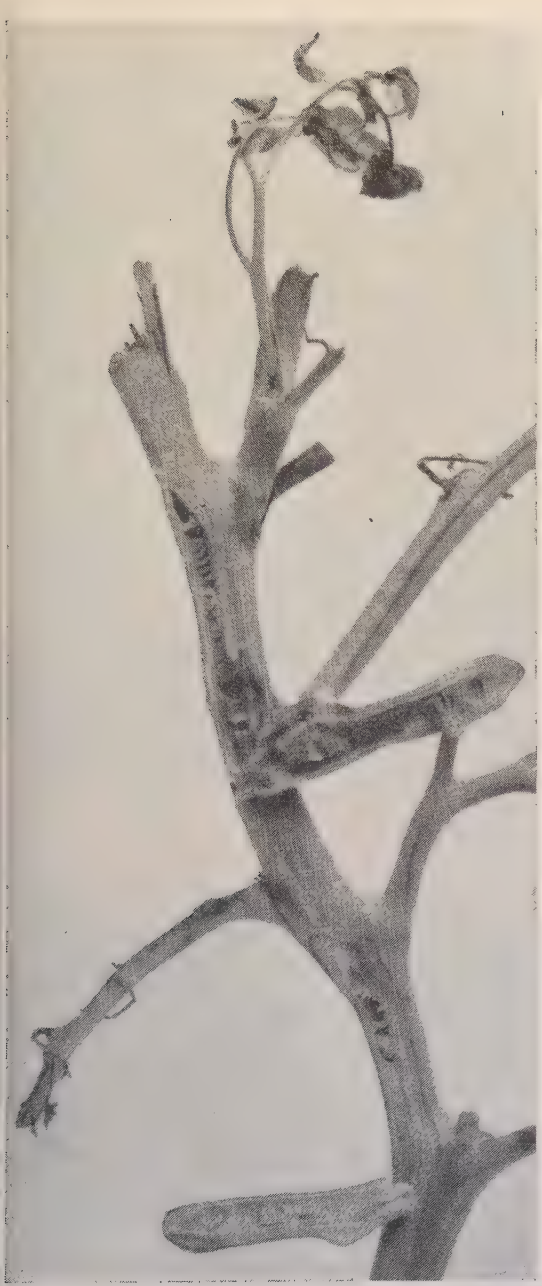

Plate 14
Pith Rot.

Available fungicides have been of no use in combating the trouble. Since its occurrence is limited to the cooler months, areas having a history of sclerotinia rot might well be avoided for crops which mature during this time.

PITH ROT

As the name implies, pith rot causes the interior of tomato stems to become hollowed out (Plate 14). The hollowing may involve the major part of the stem system, or it may be localised in the lower portion, or in one or several branches only. When the rot is extensive the stem can be easily flattened between the thumb and fingers. Small lumps due to a tendency to form aerial roots occur along the affected stems. Longitudinal cracks may occur, revealing a hollowed out interior, which may be olive green to dark brown in colour. Affected branches may wilt and perhaps die off, leaving other branches of the same plant apparently normal, or the whole plant may die. Under other conditions there may be extensive hollowing of the stem with little or no adverse affect upon vigour and cropping capacity.

There is little doubt that this trouble has at times been confused with bacterial canker disease, which it closely resembles. The absence of yellowish bacterial slime in the cavities formed inside the plant, and the absence of one-sided wilting of leaflets serve to distinguish it from this trouble.

There is a close association between the quantity of fertilizer applied and the incidence of this disease, and it appears to be a form of fertilizer injury. Several bacteria have been isolated consistently from rotted pith tissue, but it is thought that these organisms alone have not the power to decompose healthy stem tissue.

(To be continued)

More Scenes From the R.N.A.–Shell Tour

Top: Mr. Wally Mason, Instructor in Animal Husbandry at the Queensland Agricultural High School and College, Lawes, with a Pure Bred Arab Stallion. Bottom: In the background of these neat yards may be seen the 10½ million gal. dam which has been constructed at the College and which has been used to irrigate winter pastures. These and other pictures in this issue, showing "Woodland" Stud (cover), "Glenroy" Stud (page 534), Oakey Abattoir (page 554), and Canning Downs (page 592) were taken on the R.N.A.–Shell 1960 Journalists' Tour.

Measuring Grain Moisture Before Storage

3y W. T. KELSO, Senior Cereals Chemist.

So that grain can be safely stored, its moisture content must be known. An approximate figure can be obtained by testing the hardness of the grain, making allowance for the variety. Grain sampling procedures are outlined, together with methods of measuring moisture. The limitations in the use of moisture meters are discussed.

Normal moisture is the amount of water put nto the grain by the growth processes of the lant. Grain also absorbs moisture from dew nd rain.

Moisture transports the foods within the plant the seed-head and in the early stages of growth, noisture accounts for four-fifths of the total lant weight. At flowering time, in wheat, the mount of water present is reduced to two-thirds f the weight of the head. From then onwards, s the grain matures, water is lost to the tmosphere, until at maturity the grain is in quilibrium with the atmosphere. At this stage ne moisture content, under hot dry conditions, vould be approximately 10 per cent.

ate of Moisture Loss

In an experiment at the Hermitage Regional tation (Warwick), the effects of rainfall and emperature on the rate of moisture loss in wheat vere recorded, as shown in the following table:

Year	Rainfall in points		Temperature (°F.)			% Moisture in grain					
	Oct.	Nov.	Oct.	Nov.	Dec.	3rd Nov.	13th Nov.	15th Nov.	19th No.v	21st Nov.	8th Dec.
957 ..	131	6	81·3	88·4	93·2	..	..	47	16	11	..
958 ..	295	303	78	83	84·6	52	21	..	..	..	10

The rate of moisture loss in the grain during the 1957 pre-harvest period was 6 per cent. per day, while in 1958 it was only 1.2 per cent. per day, thus illustrating the delaying of maturity by the cooler, wetter conditions.

Is Moisture an Asset?

Moisture occurs in almost every known substance; the tendency is to disregard it as being an accepted thing and of not much importance. With grain, it all depends on whether you are buying or selling. If you are buying the grain, then you want as little water present as possible, because it has no economic value. A buyer wants the solid material and not the water.

Take a grain with a moisture content of 12 per cent. That means that every 100 lb. of grain has 12 lb. of water. The buyer doesn't want to buy this water but the seller wants to sell it.

Moisture can be regarded as an adulterant of the essential chemical constituents and in most grains the amount of moisture is equal to the amount of protein. Australian grain finds favour with overseas buyers because of its low moisture content, when compared with that of other countries.

In order to avoid the effect of moisture on the composition of the grain, laboratories either report the constituents at a moisture-free level, or at some specified moisture level. When a moisture-free basis is used, it means that if you took 100 lb. of grain with 12 per cent. moisture and dried it so that no moisture was left in it, you would have 88 lb. of dry material left. Say, for instance, that this 100 lb. of grain had 12 per cent. protein, that is 12 lb. per 100 lb. of grain, and on drying to a moisture-free basis, there would still be 12 lb. of protein in 88 lb. of dry material. The protein content has now risen to 13.6 per cent. If water was added to the original grain so that the moisture was raised to 13.5 per cent, then the protein content would have fallen to 11.8 per cent. Therefore the moisture content plays an important role in assessing the dry constituents of the grain.

In the wheat industry, it is convenient to report figures at a 13.5 per cent. moisture, but as long as the moisture level is stated it doesen't matter how the figures are reported, because the relevant figures at other moisture levels can be derived. Figures calculated on a moisture-free basis have not much meaning for farmers and find their favour in laboratories and scientific journals.

When is Moisture a Hazard?

Most grain crops are subjected to storage, either in bags or in silos. Grain never improves with storage, so in order to hold the grain in its original condition, strict attention must be paid to the moisture content.

Deterioration of grain results mainly from an incorrect moisture level in relation to the external temperature conditions, and length of storage. The lower the outside temperature, the higher would be the safe storage moisture level and vice versa. Excessive moisture causes overheating, increased insect infestation, musty odours and LOSSES IN GRAIN.

Experience has shown that, in Queenslanc the safe storage levels of moisture are of th order of 12 per cent. The kind of grain an the variety would determine the allowable variation in moisture content from the 12 per cen level.

Furthermore, if the grain is to be stored i bags, where there is access to the air, an increas of 0.5 per cent in the moisture content at storag would be permissible.

Over the years, handling authorities hav derived their own storage moisture levels an naturally have played safe. No experimenta evidence is available at present to alter thes figures and any change should be treated wit caution for it is a costly experience to experiment with higher moisture levels. Everyone ha to be protected. It is also costly to remov moisture by artificial heating devices, and fa wiser to let the grain come to full maturity i the field.

Estimation of Moisture

There are three main processes involved in th estimation of moisture, namely:

1. Sampling
2. Preservation of the sample
3. Measurement

1. *Sampling*. Before a sample can be analysed the operator must satisfy himself as to t uniformity of the sample and its relation to th bulk. Sampling errors can arise because a grains have not the same moisture content. Whe these grains are thoroughly mixed, it takes very long time before all the grains have th same moisture content. However, within a fe days of mixing, equilibrium will be established.

In the field, equilibrium is not obtained becaus every head has not reached the same stage c maturity.

The Standards Branch of this Department lay down standards for the sampling of bag lots, a follows:

1 bag to 9 bags, sample every bag

10 bags to 19 bags, sample every bag

20 bags to 39 bags, not less than 20 bags t be sampled

40 bags to 59 bags, not less than 28 bags to be sampled

60 bags to 79 bags, not less than 32 bags to be sampled

80 bags to 99 bags, not less than 36 bags to be sampled

100 bags to 199 bags, not less than 40 bags to be sampled

200 and over, a portion from each of not less than 20 per cent. of the total number of bags

The whole sample is then thoroughly mixed nd subsampled.

For bulk receivals a trier of about 6 ft. in ngth should be inserted in at least 10 places, venly distributed. A sample of at least 3 lb. hould be drawn, compounded from each trierful, ixed and subsampled. The design of the trier hould be such that several samples are drawn or each insertion of the trier.

In the field a sample can be drawn from the eader.

2. *Preservation of Sample.* A 2 lb. tin with "press on" lid, such as a syrup tin, is the best ype of container to use to transport and preserve ie sample. It is stressed that at no time should he grain be touched with your hands as this ct could transfer moisture to the grain. The n should be filled and the lid firmly secured, nd placed in a cool, shady place.

If exposed to the sun or heat the grain will weat and the moisture will condense on the etal when it cools off, and so reduce the oisture content of the grain.

When the sample is required for testing by a humidity type" moisture meter, the storage tin hould be about 6 in. deep and about 6 in. in iameter. About 5 lb. of grain will be required o fill this tin. The important point is to have deep tin, and the diameter can be varied to uit the availability of tins. There is no need o stress the importance of the tin being horoughly dry before using it as a storage ontainer.

3. *Measurement.* It is possible by feeling rain to tell whether it is wet or dry, but as the rain becomes drier it becomes virtually imposible to estimate the moisture content. From a knowledge of the grain and the particular variety, and using a hardness test, such as biting the grain, it is possible to store grain safely, since a very hard grain is most likely to be dry. However, as the moisture level tolerance for safe storage is small, recourse has to be made to some form of measurement.

A laboratory estimation of moisture content is carried out by heating the grain above the temperature of boiling water (100 deg. Centigrade or 212 deg. Fahrenheit). Moisture is driven off and escapes to the atmosphere and, after sufficient time, no moisture remains. The sample is then termed *moisture free*. A knowledge of weight of the sample before and after drying allows the percentage of moisture to be calculated. Moisture can also be determined by measuring the amount of moisture recovered when a sample is boiled in a mineral oil.

A new group of instruments, called moisture meters, has become available to the general public. These instruments take on various forms and measure moisture by indirect means using electrical properties, or the amount of moisture within the air spaces between individual grains. All instruments are portable and the one using electrical properties generally operates from an internal battery supply. It is necessary that these instruments be checked, and the necessary correction error applied.

Some moisture meters work with whole grain and others with coarse ground grain. A small coffee grinder is useful for grinding purposes, and as all grinding liberates heat, with subsequent loss of moisture from the sample, care must be taken to grind only small amounts and then seal the sample in a small container, if measurement cannot be effected immediately.

It is also necessary to record the temperature of the grain and a thermometer is thus required. Should the grain temperature vary from the air temperature, then time should be allowed for temperature equality to be reached. The grain temperature is then set on the meter and the moisture read on the scale provided.

The second type of meter, the "humidity type", measures the amount of moisture in the air spaces surrounding the grain, the moisture coming from the grain itself. After the meter has been adjusted, the probe is inserted into the bag or bulk and the moisture content is read on the scale.

Choice of a Meter

Factors in the choice of a meter are: (1) Ease of operation; (2) speed; (3) accuracy; (4) cost; (5) degree of portability.

Intending purchasers should acquaint themselves with the various types of meters and select the one which suits their requirements. One feature which all moisture meters have in commo is that they give inaccurate readings for grai which has been recently wet or recently drie Under these conditions, sufficient time shoul elapse for the grains to have a uniform moistur content from the surface to the interior.

For accuracy, every meter requires to b calibrated against a laboratory standard. Th Agricultural Chemical Laboratory of the Depa ment of Agriculture and Stock maintains a servic in this regard and growers are invited to av themselves of it.

* * *

Oakey Abattoir

Skinning of Carcasses at the Oakey Abattoir of Fred. Keong Pty. Ltd. Drawing stock from all over the Darling Downs and south west Queensland, the abattoir claims a monthly kill averaging 3,000 bullocks and cows, 2,500 calves, 800 sheep and 160 pigs. The buildings, covering 32 acres of the 600 acre property, include modern houses, an administrative block, garages, and a mechanical section for livestock transport and the fleet of refrigerated trucks that carry the chilled and cartonned meat to Brisbane for cold storage and shipment overseas.

Calf Scours

By E. R. JOHNSON, Veterinary Officer,
and A. HUTCHINGS, Senior Adviser in Cattle Husbandry.

The various causes of scours in calves are outlined, and methods of prevention and treatment are given.

Diseases affecting calves cause serious economic loss to dairymen. Deaths are the most conspicuous but by no means the only loss, for loss of production through delayed maturity and retarded growth is less evident but no less real.

Scour is probably the most common ailment which affects calves during the first few weeks of life.

Calves are born with very small reserves of vitamin A and little resistance to disease. They are therefore susceptible to numerous diseases which are harboured in old yards, buildings, and heavily stocked paddocks.

Colostrum

Colostrum, the first milk after calving, is particulary rich in antibodies, and contains up to 70 times the vitamin and four times the protein content of ordinary milk. Colostrum's rich antibodies protect the animal from disease. It is therefore important that the new-born calf obtain this colostrum—preferably by suckling.

The antibodies can only be fully absorbed by the calf during the first days of life. They are normally produced in the cow's body as she builds up resistance to acquired infections and transmitted to the calf in the colostrum. Buying of very young calves without their dams in saleyards, therefore, is often a hazard as far as resistance to disease is concerned.

The cases sometimes mentioned of calves being reared successfully without colostrum are the exception rather than the rule.

There is no real substitute for colostrum.

Nutrition during the First Month

The stomach of dairy cattle is composed of four compartments and this enables the animals to digest roughage. At birth only the fourth compartment—the true stomach—is functional.

For this reason the calf can digest concentrated feeds only. Furthermore, it can properly digest only milk or milk products during the first four weeks of life. Undigested material passes to the lower bowel, to further aggravate the digestive upset, and scour is started.

It is better to give slightly too little than too much feed during the first two weeks, for overfeeding will cause a scour as a result of passage of undigested food to the lower bowel. While the individual feed can be adjusted to suit the size and health of each calf, a sound guide is to give a daily allowance of milk equivalent to 10 to 12 per cent. of body weight. As an example, an average A.I.S. calf would receive 3 pints at each feed twice daily.

All liquid feeds should be given at blood heat (roughly 100 deg. F.) particularly during the first month. Feeding times should be as regular as possible. Errors in either of these conditions will set up conditions for scour.

Plate 1

Well-Developed, Healthy Calves Are the Product of Good Husbandry.

Milk with 5 per cent. butterfat sometimes causes digestive upsets. Thus Jersey milk and some A.I.S. milk should be reduced to a 3·5 to 4 per cent. test. For example, 3 pints of milk with 5 per cent. test should be broken down with four-fifths of a pint of water.

The addition of a cupful of lime water to the regular feed has been found beneficial in some instances. Lime water is prepared by adding a double handful of lime to a bucket of water and allowing it to settle. The clear liquid is then taken as required. The bucket should be covered to exclude dust and rain.

Milk Substitutes

As much wholemilk as possible is sold during quota periods on wholemilk supply farms. Under these conditions it is necessary to use substitutes. Wholemilk must be fed for two weeks, preferably longer. Until a month of age the only suitable milk substitutes are buttermilk powder and skim-milk powder. Three and a-ha oz. of powder replaces 1 pint of wholemilk 2 pints of skim-milk in energy value.

All changes in feeds should be gradual, takin at least a week for the complete change. Wh making the change the quantity of liquid shou be kept constant.

Giving free choice of good-quality, leafy gree lucerne hay from the age of 3 weeks promot the early development of the paunch (the fir compartment of the stomach). Feed must be good quality and must not be forced on the ca for if this is done some undigested material w pass to the lower bowel and cause scour.

Calves should be encouraged to eat dry me as early as possible, for with dry meal feedi there is less risk of digestive disturbances a scour.

Individual calf bails are beneficial in th respect in that calves mimic each other and th is encouraged in open bails. Furthermore, the use of calf bails prevents calves sucking each other and so reduces risk of transmitting some diseases.

Simply constructed wooden sword bails are quite suitable for the job.

Treatment of Nutritional Scour

The skill and careful observation of the husbandman is all important in preventing, and treating, scour. Early treatment is most helpful. When scouring occurs the affected animal should be starved for one day, given a dose of 2 oz. of castor oil to remove the undigested material, followed by water which has been boiled, and an antibiotic.

Poor calf husbandry and infectious scour are closely inter-woven. Two types of farmers will agree with this—those who have prevented calf scour and those who have successfully treated it.

To-day, with the available hard-hitting modern drugs on hand, there is a tendency to neglect management in the treatment of calf scour. This is false complacency. Corrective husbandry must be a part of therapy.

Calf scour can often be related to age groups.

White Scour

This type of scour is most commonly encountered in the first 7 days of life but calves up to 3–4 weeks may be affected. The cause is generally accepted as being due to a rod-shaped bacterium called *Escherichia coli.*

Escherichia coli is an organism which lives normally in the lower bowel of all calves and cows, and it will invade the bloodstream and intestines in adverse conditions. In an affected group, calves may be infected by mouth or via the navel.

Undoubtedly the biggest cause of white scour is failure to receive colostrum. Colostrum contains antibodies to the white scour bacteria, these antibodies finding their way to the bloodstream minutes after colostrum is ingested. A calf without antibodies finds it difficult to keep the bacteria confined to the lower bowel. Colostrum-fed calves, otherwise weakened, can be stricken, especially if the bacteria enter navel or mouth.

Symptoms.—The white smelly scour is well known. It usually develops at 2 or 3 days of life, is accompanied by loss of appetite, high temperature, dullness and a tendency to sleep. Deaths are frequent and follow rapidly due to blood-poisoning. Other calves may survive a few days then die from dehydration. In these cases the eyes are sunken, coat is harsh and dull, and the temperature subnormal.

Individual calves may die suddenly with no symptoms, not even a scour. This is due to very sudden blood-poisoning.

Surviving calves sometimes develop swollen joints and a limp. This arthritis is due to the lodging of *Escherichia coli* organisms in the joint during the fever stage.

Treatment.—In an affected calf group a thermometer is an essential tool. All temperatures should be noted and the normal-temperature calves shifted to clean quarters. Thereafter, their temperatures must be taken twice daily to detect any new cases.

The isolated affected group should be treated with an antibiotic such as streptomycin or oxytetracycline or possibly a sulphonamide such as sulphadimidine or phthalylsulphathiazole, together with lime water or chalk (1 or 2 oz. twice daily).

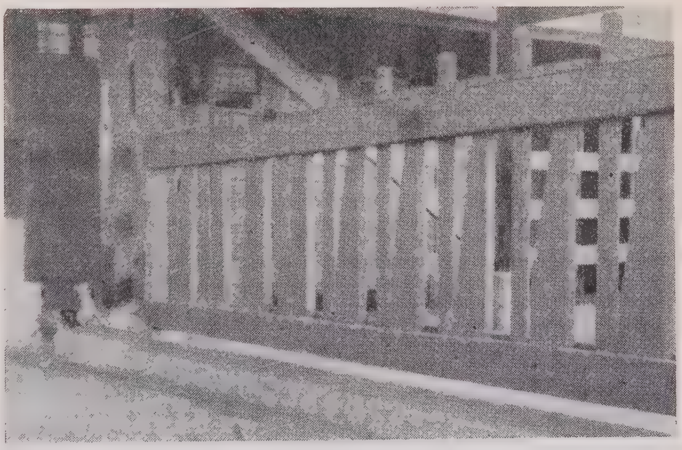

Plate 2

The Surroundings of These Calf Feeding Bails Are Easy to Keep Clean.

Plate 3

The Result of a Salmonella Infection.

This treatment is aimed at:

(*a*) The herd and the individual calf.
(*b*) The infection and the fluid loss.

Calf Coccidiosis

A blood scour in calves often indicates Coccidia organisms. These organisms attack the lining membranes of the intestines with severe consequences.

Calves between the ages of three weeks and three months are commonly affected, though older age groups are involved on some properties.

Humid and moist conditions can quickly cause a build-up of Coccidia and outbreaks may verge on the explosive, especially where calves are crowded together.

Symptoms.—A Coccidia scour may start directly as a blood scour but more commonly it begins as a non-blood scour which may resolve spontaneously or turn into a blood scour after a few days. Blood scour may follow on white scour. In severe cases pure blood i passed. Strips of intestinal lining are often she and calves may die from haemorrhage. Strainin after a motion is commonly observed. Appetit is depressed though affected calves usually ten to keep feeding.

Dehydration or blood loss, or both, ar responsible for the deaths that occur.

Treatment.—Two specific drugs are availabl to counter the disease. One is sulphamezathine the other is called mepacrine hydrochloride Both give good results.

The sulphamezathine should be given by mouth.

Both treatments need to be combined with isolation of affected animals and elimination o wet or boggy areas.

Prevention.—Coccidia need temperature an moisture to multiply. You may not be able to do much about temperature but you can do much to eliminate the moisture factor.

Any system which rotates or disperses calves is to be commended. Set stocking of calves in any one area favours a flare-up of the disease.

Salmonellosis

Salmonellosis is a bacterial disease which is sudden and severe in cattle and other species. Calves of any age tend to be affected as a mob and the infection is commonly fatal.

Salmonella is a bacterium which first infects the gut and intestines, causing a gastro-enteritis. From the intestines it can quickly poison the bloodstream and cause sudden death. The organisms can be carried on to properties by rats, mice and other rodents and survive in moist organic matter from whence they multiply and may be ingested. However, carrier calves or adults are more often the origin of the infection.

Symptoms.—The disease is frequently sudden in onset. Some calves may be found dead, with others displaying a high fever, drooling and breathing with difficulty. Temperatures may top 106 to 107 deg. F. Scouring in sick animals is usual. The motion is largely fluid, green and profuse with flecks of blood through it. The odour is offensive.

Deaths follow within 2 or 3 days and are due largely to bacterial blood-poisoning. Few affected animals recover, whereas with Coccidiosis, *large quantities* of blood are usually passed and *most* affected calves recover.

Treatment.—Many treatments have been tried. None are wholly effective. Penicillin does *not* give good results. Sulphamezathine gives variable results, but some of the broad spectrum antibiotics may give satisfactory results.

Once again, isolation should be practised together with an attempt to trace the source of the infection.

Other Causes of Scour

(*a*) *Internal parasites*

The two most severe worm infestations affecting Queensland calves do *not* cause a severe scour. These are *Haemonchus* (barber's pole worm) and *Bunosotomum* (hookworm). However, there are types of worms that do cause a marked scour. One type is *Trichostrongylus* (hair worm) which is responsible for diarrhoea or "black scour" in calves between the ages of three months and two years. This condition nearly always depends for its appearance on a poor nutritional status as well as a Trichostrongylus infestation. Hence in Queensland it occurs in late winter to spring. Wet winters are usually a preliminary requirement for severe Trichostrongyle infestation. Successful treatment consists of provision of adequate good feed following phenothiazine drenching.

Oesophagostomum (nodule worm) is frequently encountered in Queensland calves, inhabiting the lower bowel with the formation of fibrous nodules. Symptoms are wasting and diarrhoea, with possibly a stilted gait. Phenothiazine is very effective, especially in large particle form. After drenching, fresh pastures should be provided.

(*b*) *Copper deficiency*

Copper deficiency occurs in many areas in Queensland. This can be responsible for a scouring disease but is, as yet, not fully understood. Furthermore, this deficiency is similar to and frequently associated with the parasitic infestations. If calves are shown to be deficient in copper, various forms of therapy may be tried.

(*c*) *Arsenic poisoning*

Arsenic poisoning is responsible for a profuse, non-blood, very fluid scour. Other signs will surely be present and, in a calf group, deaths are likely. Temperatures in these calves are either normal or subnormal. Cattle like the taste of arsenic and will seek it if it is accidentally available.

(*d*) *Bracken Fern poisoning*

Bracken fern can cause a severe, bloody foul-smelling scour. Like arsenic it will be attended by other severe general signs such as small haemorrhages over various body membranes, abdominal pain, high temperatures (note this, for in nearly all plant or mineral poisonings, temperatures are either normal or sub-normal) and sudden deaths. Treatment is of no avail.

(*e*) *Fevered Calves*

Calves fevered from various causes may show transient scour.

(*f*) *Virus Diarrhoea* (*Winter Dysentery*)

Quickly affects whole herd, including calves, with a watery diarrhoea.

pasture and crop

Fertilizer Distributor Care.—Care spent in preparing a fertilizer distributor for the spring will help to ensure accurate spreading and may also prevent stoppages which may interfere with your fertilizing programme.

The fertilizer used must be free flowing if calibrations are to remain accurate. This is equally true whether your machine is of the direct drop or of the broadcasting spinner type. Give your machine a fair chance by storing the fertilizer carefully so that it does not cake. If it has become lumpy, pour it into the hopper of the distributor through a framework of ⅛ in. wire netting. Any lumps left on the wire netting can be crumbled up by hand or rubbed through the sieve.

When an oil can is used to lubricate such parts as the feed gate setting control, take care that excess oil does not run on to the teeth of exposed gear wheels. Remember an oil surface holds fertilizer powder and this makes a grinding compound which will cause the gears to wear. When greasing a shaft bearing fitted with plain bearings, continue to pump grease into the housing until the old grease can be seen oozing out.

When greasing the bottom bearing of the agitator shaft of a spinner type distributor, use a good quality light grease which does not oxidise and become hard, because although there may appear to be plenty of grease, it may in fact not be in contact with the moving surfaces of the bearing.

The position of the arc of spread of spinner types can be adjusted by altering the position of the cut-off plate. Under certain conditions, such as hillside work, the careful adjustment of this control can make a big difference to the evenness of the distribution achieved.

—*C. G. WRAGGE, Agricultural Engineer.*

Water Penetration.—Study of water penetration in the heavy clay soils of the Burdekin River area has been a feature of the work conducted at Millaroo Regional Experiment Station for the past few years.

The heavy soils of the Burdekin range in type from massive clays to sandy clay loams, and generally contain undesirable amounts of the element sodium. The occurrence of sodium is associated with intractibility of the clay, and water penetration in these soils is very slow. Prolonged water-logging occurs on these soils after heavy rain or flood irrigation, and this condition greatly hinders the establishment of most crops and pasture species.

Methods of improving rate of water penetration have been investigated on the heavy soils on the Burdekin. Soil conditioners, designed to promote crumb structure, are useful in some cases, but are too expensive for large areas. Gypsum is a soil ameliorant, and large quantities of this substance may gradually improve structure. At Millaroo Station, gypsum has been broadcast on the heavy soils at rates up to 10 tons to the acre, in conjunction with deep ploughing practices. Due to the slow-acting effect of gypsum applied in this way, such trials require several years of observation. Cropping may help to renovate poor soil structure and the effect of grasses in this regard is well recognised.

Recent work carried out on the heavy soils of the Riverina district in New South Wales, has shown that water penetration can be greatly improved by using water containing a small amount of dissolved gypsum.

Preliminary work has indicated that similar results are possible with the heavy soils of the Burdekin. In one small scale trial, the penetration rate of water with dissolved gypsum was up to four times that of ordinary irrigation water. These investigations are being continued to probe the implications of increased water penetration and its relation to crop growth. If successful, this work could lead to greatly improved ease of handling of the heavy Burdekin soils for the establishment of suitable crops.

—*R. L. HARTY, Agronomist.*

Roadside Plots Spread Pastures.—Roadside plots of buffel grass appearing unexpectedly in scattered parts of south-western Queensland are the result of a deliberate Agriculture Department plan. They did not get there by chance.

The Minister for Agriculture and Stock (Hon. O. O. Madsen, M.L.A.) said most of the plots had been planted by Mr. R. G. Wilson, Adviser in Agriculture in the Department. Mr. Wilson is specialising in pasture establishment work throughout the Toowoomba-Quilpie area.

Over the years, Mr. Wilson has made a practice of sowing small plots of buffel grass on suitable roadside sites. When he passes that way again, months or even a year later, he can look at the planting and observe the success of establishment and rate of spread.

Mr. Wilson is secure in the knowledge that buffel grass can only improve the country it is sown in. It can never become a pest.

On a recent 600-mile inspection tour from Charleville to Windorah and south to Bromaga, Mr. Wilson planted roadside observation plots at a number of likely sites. He planted six different buffel grass strains, all treated with an ant deterrent. The planting sites were largely protected—grids, fallen mulga branches, under mail boxes and signposts, moister river and creek crossings and sand dunes.

Mr. Madsen said these roadside plantings are an economical means of gauging the suitability of the various buffel grass strains in remote and widely separated districts. A few pounds of seed sown in these small plots over long distances of road can give a pretty clear picture of the range of buffel grass in the west.

He said it would be recalled that Mr. Wilson has also been active in establishing "hobby" plots on properties of interested graziers. These are small plots in which a variety of grasses are planted both with and without fertilizer. These plots are showing that buffel grass, green panic, blue panic and Rhodes grass have a place on various soil types on the western Downs and in south-western Queensland. The fact that many graziers are already expanding hobby plots into larger plantings is proof of their value.

Roadside plantings, he said, could be pointers to soil types that would merit a more thorough study of pasture species in hobby plots.

Tips on Buying Used Tractors.—Buying a used tractor? Now that's often the way to get an auxiliary power plant cheaply or to pick up a model that would have a special and useful place on your farm. But buying a used tractor can be a highly tricky business unless you're awake to all the pitfalls.

Many of the pitfalls are obvious, and avoiding them is just commonsense. But sometimes, experienced tractor buyers are taken in—and most farmers aren't experienced tractor buyers.

The inspection of a used tractor that interests you should proceed along these lines:

First, see how closely the unit corresponds to its original condition. If the various gauges and headlights have been replaced, make sure that the replacements can do the job efficiently. Try to discover the reason for the replacements and decide whether the original trouble is likely to recur. Then examine the visible moving parts. These include the king-pins, tie-rod ends, fan, steering box, tyres and the front and rear axle bearings. Even if only one of these vital parts has to be repaired, the cost of repairs is a figure to be deducted from the value of the unit. The next thing to inspect is the engine. Start the motor and check the oil pressure and the electrical system. After a warm-up period of three or four minutes, check the exhaust for indications of excessive oil burning.

Before looking at the transmission, examine the clutch to find out whether it has sufficient life left in it to do a good job for you. Testing the clutch is simple—just carry out normal gear changing, and listen for undue clashing of the gears. Without going to the expense of stripping the unit, you can test the condition of the transmission by ear.

If you hear peculiar noises, the chances are that the bearings or gears are badly worn or the gears are chipped. A whining sound indicates wear and a grating noise warns you of chipped gears. Cracked or welded transmission housings should be treated with the utmost caution. Misalignment of the shafts is a common fault after a welding job.

—*C. G. WRAGGE, Agricultural Engineer.*

Soils for Irrigation.—Where a choice is possible, selection of the most suitable soil type for irrigation allows the farmer to make the most efficient use of irrigation water. The water soakage and water holding capacity of a soil to be irrigated should be studied, and irrigation adjusted to suit each particular soil type.

A soil type's first requirement for irrigation is its ability to absorb water. It must be capable of absorbing water freely to the root zone of the crops. Clay soils absorb water slowly. These are said to have a low soakage rate, and difficulty in wetting the soil is often a problem. Small flows continued for a long time are necessary to wet the soil to the root zone.

Sandy soils have a high soakage rate and the water penetrates deeply. These require light applications at frequent intervals because heavy flows will soak beyond the root zone and the water is lost to the plants. An ideal soil for irrigation is a loam or medium clay loam. These soils not only absorb water freely, but also have the capacity to retain a great deal of it.

When a soil can retain no more moisture it is at field capacity. But all this water is not available to the plants. The capacity of a soil to hold water for plant growth may be illustrated in a simple if not exact way by placing a sponge in water. The water held by the sponge after the free water has drained away represents the field capacity. When the sponge is squeezed, the available water is removed. But some water is still retained by the sponge, and in a soil this represents the unavailable water. Wilting point is reached when only the unavailable water remains in the soil.

Clay loam and clay soils have a high field capacity, about 40 per cent., and a high wilting point, about 20 per cent. The available water in such a soil may then be in the region of 20 per cent. Sandy or sandy loam soils, on the othe hand, have a field capacity of 12 to 15 per cent and a wilting point of 5 to 8 per cent. The available moisture, therefore, is only 7 to 9 pe cent. The advantage of irrigating soils that hol a large amount of water for plant use is clear Fewer applications are needed for high efficiency

—*A. NAGLE, Irrigationist.*

Control of Johnson Grass.—Once we've had some rain, Johnson grass will be showing through —on many Queensland farms.

The best time to spray is when Johnson grass has 7 leaves and is about 1 ft. high.

The best chemical to use is Dalapon and three sprayings a week to a fortnight apart of 5 lb to the acre are better than one spraying of 15 lb Use 100 gal. of water to the acre for each spraying.

There are practical difficulties in putting on 3 sprays and work is in progress with other chemical mixtures to try to reduce the treatment to one spraying. We'll know more about this next summer.

Whatever you use, don't expect to get rid of Johnson grass in one season. You're always likely to get some regrowth from the roots, an seedlings will keep coming up unless you pu the ground under pasture.

—*H. KLEINSCHMIDT, Botanist.*

Row Direction and Blue Mould.—Field survey work has shown that row direction has an important bearing on the severity of blue mould in tobacco. During the 1958 and 1959 seasons, plantings in an east-west direction suffered an average of 36 per cent. more leaf mould than plantings in a north-south direction.

In the 1958 season, plantings in an east-west direction suffered 56 per cent. more stem mould infection than plantings in a north-south direction.

Of all the farms that showed stem mould in the 1959 season, two-thirds were planted in an east-west direction.

Of course it is not practical at times to plant tobacco in a north-south direction. But, wherever possible this row direction should be adopted to reduce blue mould losses.

—*I. K. HUGHES, Plant Pathologist.*

New Cheese Types For Queensland

By T. A. MORRIS, Dairy Technologist.

The manufacture of Continental types of cheese in Queensland will most probably be expanded considerably within the next four years. Investigations carried out during a recent study-tour of England, Denmark, Holland and France showed that the manufacture in Queensland of a number of these cheeses would be technically possible.

A detailed study was made of the characteristics of some non-cheddar varieties of cheese and of the manufacturing methods used in their production. While it was not always considered that the cheese variety being studied would be suitable to Queensland in its normal form it was thought that some adaptation of such cheese could be of advantage.

The varieties of cheese which were studied included the following:

Variety Name	Country of Manufacture	Main Characteristics
Cheshire . .	England . .	High acid taste, mild cheese flavour, moderately firm but crumbly, creamy white in colour, " loose " in texture
Stilton . .	England . .	Strong aroma but rich and mellow flavour. Fairly soft body, open texture, creamy grey colour veined with blue-green mould (Plate 2)
Samsoe Group	Denmark . .	Mild and aromatic flavour. Fairly firm waxy body, very smooth and completely close in texture except for a number of round uniform holes. Light yellow colour (Plate 3)
Samsoe Group with Carroway seed	Denmark . .	The same mild cheese flavour with the spicy flavour of Carroway seed. Holes are much more numerous and more irregular. The black seeds appear throughout the cheese
Maribo . .	Denmark . .	Mild, slightly acid, aromatic flavour. Fairly firm, slightly short body. Numerous small and rather irregular holes. Light yellow colour
Havarti . .	Denmark . .	Moderate, piquant and slightly proteinaceous flavour. Moderately firm to soft body. Numerous irregular holes. Yellow colour (Plate 1)
Danish Blue . .	Denmark . .	Mild aroma, clean sharp and piquant flavour. Soft body. Smooth texture with irregular openings permeated by blue-green mould, against a white background (Plate 4)
Gouda . .	Holland . .	Sweetish, mild and aromatic flavour. Fairly firm, waxy body. Smooth, close texture except for a small number of round holes. Light yellow colour (Plate 5)
Edam and Broodkaas	Holland . .	Similar to Gouda but slightly more dry and firm (Plate 6)
Antibiotic Gouda	Holland . .	Gouda cheese made using nisin producing cheese starters

Variety Name	Country of Manufacture	Main Characteristics
Friesian and Leiden	Holland ..	Mild, slightly acid flavour with the addition of the taste of cloves in the case of Friesian and cumin seed in the case of Leiden cheese. Fairly hard body, numerous irregular openings. Straw coloured (Plate 7)
Saint Paulin ..	France ..	Mild, aromatic and very slightly proteinaceous flavour. Soft pliable body. Close texture except for a few round holes. Yellow colour
Camembert and Brie	France ..	Moderate sweetish, aromatic flavour. Soft mellow body. Completely close texture. Yellow colour (Plate 8)
Carre de Lest	France ..	Similar to Camembert but slightly more mild in flavour (Plate 9)

Suitability for Queensland

There does not appear to be any technical reason why most, if not all, of the varieties of cheese studied could not be manufactured in Queensland. However, the successful marketing of some rather perishable varieties such as the mould-ripened cheese (for example Brie, Camembert and Carre de Lest of France, Danish Blue of Denmark and Stilton of England) would be difficult unless more widespread use of refrigerated transport was possible.

Plate 1

Danish Havarti Cheese Wrapped in Aluminium Foil.

A period of experimentation to adapt th methods employed in the countries visited t conditions within the Queensland industry wou no doubt be necessary before any one variet could be fully commercialised in this country.

A further slight hindrance to rapid comme cialisation of these non-cheddar varieties o cheese would be the necessity to train loc cheesemakers in the manufacturing techniqu necessary.

However, it is felt that a skilled cheesemake given the proper technological guidance, cou soon adapt himself to the differing techniqu required to produce cheese of different types.

The length of time required to develop th manufacture of the different types could b expected to vary according to the degree o similarity to cheddar cheese, with which Queen land cheesemakers are very familiar and in th manufacture of which many have acquired a hig degree of skill.

Thus it could be expected that a variety suc as Cheshire could be produced to a satisfactor standard of quality in a short time.

On the other hand, the adaptation of th process of manufacture for Stilton or Dani Blue cheese could be expected to take a longe time because of the vastly different manufacturin methods involved.

It is not considered that an exact replica o all of the varieties of cheese studied could b produced in commercial quantities i Queensland within the space of a fe years. The acquiring of skill in dealin with possible variations in local con ditions not experienced in the countr of origin of a variety of cheese is some thing which requires considerable time However, it is not felt that the produc tion of an exact copy is necessary o desirable in the case of every variety o cheese. The development of com mercialised manufacture to a satisfactor standard of quality, without stric adherence to the exact properties of th original variety, could be expected to b achieved in a reasonable time.

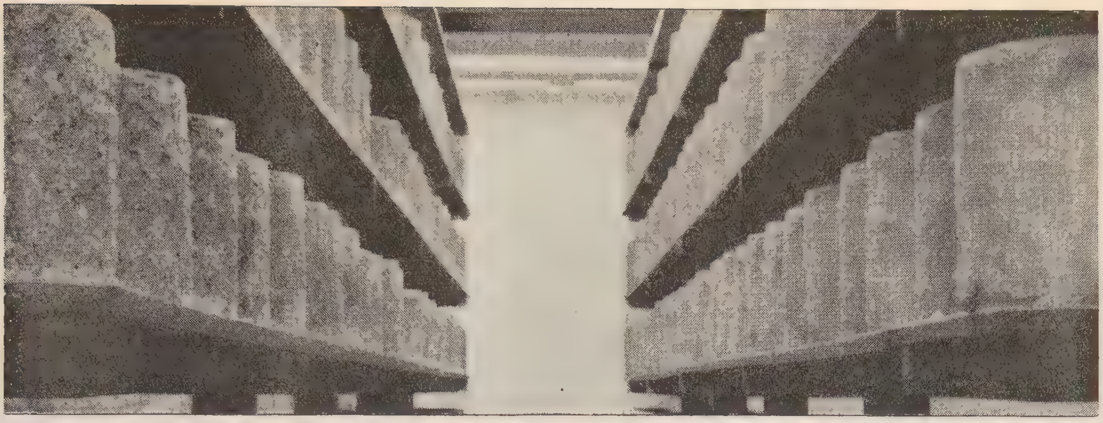

Plate 2

English Stilton Cheese Maturing on the Shelves of a Ripening Room.

It is felt that the first need is to supply the local market with a greater variety of cheese, thereby ensuring an appeal to as wide a range of tastes as possible. To do this it is not so necessary to reproduce other known varieties but rather is it necessary to ensure that the varieties produced are sufficiently different among themselves to ensure that each has an appeal in its own right.

It will be in the attaining and control of differences between differently named cheeses that the study of the manufacturing methods of specific varieties will prove of most value. That is, a manufacturing method should be considered as a means of attaining a certain desired end and not as an end unto itself.

The foregoing implies that the naming of any new variety of cheese may differ from that on which it is patterned. In some cases this may be an advantage rather than otherwise; for example, if the original variety is not one which is well known by name within this country or if the original variety may sell in free competition with the developed variety without a marked price difference. In the latter case what may be called the "genuine" article has a definite advantage and may be sold to the exclusion of the developed variety. If the developed variety has an appeal in its own right without being merely an attempt to duplicate the original type it has a greater chance of attracting new consumers.

This does not eliminate the need for some manufacture of certain "name" varieties and indeed some production of fairly well-known cheese such as "Gouda" and "Edam", is considered desirable, especially if such production is required to fill a gap in imports or if the local product can be marketed, at a price which is highly competitive with that of the "genuine" cheese. The obvious advantage of the manufacture of a known variety is that its marketing can

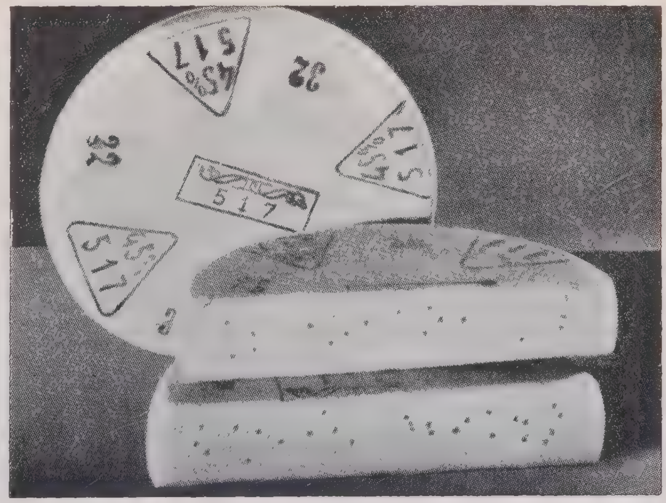

Plate 3

Danish Samsoe Cheese.

Plate 4
Danish Blue Cheese.

be carried out without the same need for intensive efforts to make the product familiar to cheese consumers.

Stages in Development

Bearing all these factors in mind it would therefore seem that a fairly logical procedure for the development of commercial production of non-cheddar varieties of cheese in Queensland would be as follows:

1. The improvement of techniques and an expansion of the manufacture of Edam, Loaf Edam and Gouda cheese which is already proceeding on a small scale as a result of previous experimental work.
2. The continuance and the intensifying of experimental cheesemaking previously begun with the intention of developing a distinctive product especially adapted to local conditions but based on hard Dutch and Danish cheese varieties and employing various additives such as spices or "smoke essence" to give as wide a range of flavours as possible.
3. The further development of methods for the production of high acid cheese of the cheddar or Cheshire type employing a stirred curd technique.
4. The carrying out of research and experimental work to develop a suitable type of blue mould cheese for manufacture and marketing under Queensland conditions.
5. The development of methods of manufacture for the production of lactic type soft cheese for city areas.
6. The development of the manufacture of soft mould ripened types of cheese for city areas.

Plate 5
Packing Gouda Cheese in a Large Dutch Cheese Store.

Plate 6

Edam Cheese on Shelves in a Curing Room.

Stage 1. While the manufacture of small quantities of Edam and Gouda cheese has been carried out fairly successfully in previous work, much has been learned in regard to how the quality of this cheese may be improved and how manufacturing methods may be placed on a commercial basis. No major changes in existing factory equipment appear to be necessary but some small special pieces of equipment would be required and a cheese brining room would have to be added to factory buildings. Some provision of specially shaped shelving is also needed for Edam cheese.

One major difficulty in the past has been the obtaining of a supply of the characteristically shaped moulds for forming the cheese. However, it was found that plastic moulds are now being produced in Holland at a much lower cost than the traditional wooden moulds and it is thought that a number of such forms could be imported or else manufactured within Australia.

Stage 2. The production of a low acid, rindless cheese, with excellent slicing properties and a distinctive flavour, which could be very useful for the cafe and sandwich bar trade—as well as for ordinary household purposes—has been the object of experimental manufacturing previously carried out. With the experience gained in Denmark and Holland it should now be possible to carry this work much further..

Since the trade which is being specially catered for demands a low-cost cheese, it is expected that the use of partly skimmed milk will be to advantage. (Much cheese in Denmark and Holland is produced with only 40 to 45 per cent. fat in the dry matter.) It is thought that as a further advantage the one basic curd-type could be used to produce cheese of different flavours by the addition of smoke essence or spices such as cloves and carroway seed.

Stage 3. The popularity of high acid cheese of the cheddar type can be expected to continue and the provision of some greater range within this type is warranted. The rather time-consuming and laborious nature of the traditional cheddar (and Cheshire) processes necessitates a consideration of the use of methods capable of being highly mechanised. It is suggested that the "stirred curd" type of cheese previously produced in Queensland, could be developed to supply the need in regard to this class of cheese.

The possibility of producing cheese of this type suitable for exporting to the United Kingdom should not be completely discounted, especially if more economic manufacturing methods than the traditional ones can be developed.

Plate 7

Friesian Cheese Showing the Black Spotting Due to the Addition of Cloves.

Stage 4. The sales of cheese of the blue-mould type forms a fairly considerable portion of the total sales of non-cheddar cheese in Queensland and consideration should therefore be given to the possibilities of local production.

However, many more changes in cheese factory buildings and equipment would be necessary for the production of a blue mould cheese than for the production of the types concerned in the previous three stages. It is commonly found essential for the manufacture of this type of cheese to be isolated from other cheesemaking operations in order to have better control over the mould growth. Special salting and curing rooms are also necessary since a very high humidity has to be maintained at least until the cheese is 6 to 8 weeks old.

Before any company could be expected to undertake the expense involved in such major additions to its cheese factory it would be necessary to ensure that a blue mould cheese of a suitable type for Queensland could be produced. I feel that some experimental work to first find a means of combining the best features of Danish Blue and Stilton cheese would be very worthwhile even though it is felt that cheese similar to Danish Blue could be fairly readily produced, given the proper facilities.

Plate 8

Brie Cheese on Rustless Metal Racks in a Cheese Curing Room in France.

Stage 5. The production of cottage cheese has been carried on in Brisbane for some years and for the present there does not appear to be much scope for the expansion of this trade in soft unripened cheese by the introduction of new types. However, one popular type of cheese noted in England and known locally as St. Ives cheese could have future possibilities in city areas. This cheese is basically a mixture of a *Lactobacillus bulgaricus* curd with minced mature cheddar cheese.

Stage 6. This rather distant stage would involve the manufacture of cheese of the Camembert, Brie and Carre de Lest type. In this group the Carre de Lest type may eventually be most suitable as its manufacture is based on the use of pasteurised milk.

Stages 1, 2 and 3 could be carried on concurrently and are regarded as worthy of equal priority. Stage 4 involves a fairly long-term operation and could not be considered as offering any quick results. It is felt however, that it forms an important part of the overall programme of development, and should receive attention just as soon as the first three stages are carried to a satisfactory degree of completion.

Stage 5 involves the manufacture of soft rather perishable cheese suited only for production close to the region of consumption. To gain sufficient sales to make production economical, the location of manufacture would need to be close to a large city such as Brisbane. The present limited possibilities for the significant production of cheese of this type necessitates giving a rather low priority to this stage.

Similarly Stage 6 offers very limited possibilities and for the present can only be regarded as a provision for possible future changes in eating habits and increases in urban population.

Rationalised Production and Advertising

In the conducting of such a programme for the development of the commercial manufacture of non-cheddar varieties of cheese one important fact which should be borne in mind is the need to maintain rationalised production of the different varieties. It would be rather pointless for a number of factories to be each producing a small quantity of the same variety of cheese, just as it would be nconvenient and uneconomical for each factory to be producing a small quantity of a number of different varieties.

The most economical pattern for development would therefore seem to nvolve the confining of the manufacture of each variety of cheese to one or two particular factories and the limitation of the number of varieties produced at any one factory. The most desirable means of achieving this would be by voluntary co-operation on the part of the factories. If this most satisfactory state of affairs could not be attained then production could be rationalised by Government regulation and the issue of special cheese manufacturing licences for the production of varieties of cheese.

If any programme for the development of the production and marketing of new varieties of cheese is to succeed it must be conducted concurrently with a campaign of advertising and publicity designed to bring the availability of the new types of cheese to the notice of the public. It is considered rather pointless to produce a wider selection of varieties of cheese if the public are not to be adequately informed in regard to what cheeses are being made available and what the special attractions of those cheeses are.

The growth of awareness of new types of cheese is very slow if it is left to the chance nterest of the buying public, and under these circumstances the rapid development of production must result in a quantity of cheese being stored much longer than is desirable with poorer quality and higher costs as a possible consequence.

Plate 9

A French Dairy Technologist Tends Ripening Carre de Lest Cheese.

Increased Consumption

It is natural to expect people to tire of a foodstuff when it is served repeatedly without any variation. The production of a greater variety of cheese in Queensland would allow a change to be obtained readily whenever a consumer desired it. An appeal would be ensured to a wider range of tastes than is achieved by presenting only Cheddar cheese.

These factors would combine to promote a greater consumption of home-produced cheese, with a resultant benefit to the cheese industry, not only in this State but in the whole of Australia.

❧

This Age of Oil

The history of the oil industry in Australia and the part which it has played in the development of this country are traced in a handsome, avishly illustrated book, "This Age of Oil". A chapter on farm machinery says: "If the Industrial Revolution was based on coal, the agricultural revolution is based on oil. Petroleum, an indispensable ally in almost every phase of food production, must play an increasingly important part not only as the source of fuels and lubricants but also as the base material for the manufacture of fertilizers, pesticides, weed-killers and other products."

stock and station

Culling Your Breeders.—Let's suppose that you have decided which cows will comprise your breeding herd. From then on the number one yardstick as to whether they stay in the herd should be the regularity with which the individual cows produce calves.

I can well imagine you saying, "But what about quality and conformation of the calves and the ability to grow quickly? Surely, they're important," you say.

I agree, they *are* important. You'll agree, too, I'm sure, that you must have a calf before you can have any of those things. So I repeat, look for a calf a year from your cows; and of course, you'll cull any really poor type heifers before they have the chance to enter the breeding herd.

You can't afford to cull for many points in your breeding herd; when the shy breeders have been taken out you will probably find you have reached the culling limit for the year.

That is not to say that you can't do anything about selection for growth rate and conformation. You do this in the selection of herd bulls; and of course you can improve faster by selection for these characteristics in bulls rather than in cows.

To sum it up, concentrate selection on regular calf production in the cows, and on desirable beef characteristics in the bulls.

—*J. G. YOUNG, Senior Husbandry Officer.*

Salt Poisoning of Sheep.—Many bore and sub-bore waters contain salt and other minerals which become concentrated when evaporation takes place. In a classical case of salt poisoning of sheep, analysis showed 1,650 grains of salt per gallon of water in the trough, this was about four times as high as the salt content of the water in the delivery pipe (420 grains per gallon).

If gradually conditioned to it, sheep can take 600 grains of salt per gallon or higher. Care is necessary where sheep not used to it are put on waters high in salt content. Sheep tend to drink more of water containing salts such as sodium or magnesium chloride than of salt-free water This tendency is aggravated under hot summer conditions. Where magnesium chloride content is high sheep eat less than normally. Over 200 grains per gallon of calcium or magnesium chlorides or sulphates in water can cause death Over 150 grains can cause scouring. Care should be taken with any waters for sheep with over 1,000 grains of total soluble solids to the gallon

If you have a new bore or are doubtful about the safety of mineral contents in existing bores call your nearest Sheep and Wool Adviser to obtain samples for analysis.

Where existing waters are mainly salty, provision of alternate surface water may make considerable improvements in the economic returns yielded by the flock.

—*R. B. YOUNG, Senior Adviser, Sheep and Wool.*

Promise in Supplements for Beef Cattle.—Supplementary feeding trials during the last two years have given valuable leads on suitable methods and materials for use with beef cattle This information can be used to advantage when such a form of feeding is undertaken.

A small quantity of protein-rich food allows the animal to make better use of dry, standing pasture. The high quality feed also maintains the animal's appetite. In this way the extra food provided is added to the value of the standing grass. The supplement is not used merely to replace some of the grass the animal would otherwise have eaten. This is the whole idea behind supplementary feeding.

On central coast and central highlands properties, trial groups of cattle have responded very well to supplementary feeding in the winter. These cattle were given a little lucerne hay or cottonseed meal to supplement standing, mature grass when its food value was low and it was unpalatable. At the end of the feeding period, cattle fed the supplement were 70 lb. a head heavier than those fed pasture alone. However, the unsupplemented stock made up some of the leeway in the following summer.

In the trials, the stock were fed twice a week. Where lucerne hay was used as the supplement it was fed at 3 lb. a head a day, which is roughly equal to one ton a week for 100 head. On properties that used cottonseed meal, this supplement was fed twice a week at 1 lb. a head a day.

Although different properties were involved, the response to lucerne hay and cottonseed meal at the rates fed was roughly the same. At these rates, the supplement provided about ⅓ lb. of digestible protein a day for each animal.

There seems no reason why other protein-rich foods supplying ⅓ lb. of digestible protein a day should not give results of equal value.

Lucerne hay is the easiest supplement to feed equitably to stock. This is because it is bulky and can be spread over the ground. Meals have to be placed in troughs. Because cattle can eat meals quickly, there must be sufficient trough space for all the animals to eat at once.

—*D. N. SUTHERLAND, Director of Cattle Husbandry.*

Arsenical Poisoning in Cattle.—Banana plantations often turn out to be death traps for cattle. This is because the stock, usually house cows and their calves, are constantly getting into banana patches where the weeds have been sprayed with arsenical weedkillers.

Every summer brings its quota of reports from banana growers who have lost cattle from this cause. Arsenical weedkillers are cheap and effective in keeping down weeds in banana plantations, and can be expected to remain in use for a long time yet.

The best safeguard against losses from arsenical poisoning is a secure fence around banana patches likely to be sprayed. Until internal fencing is completely overhauled, farmers combining dairying with banana growing should always be prepared for odd cases of arsenical poisoning among their cattle. The salty flavour of arsenic makes weeds and grass sprayed with the poison palatable to stock. For an emergency, a supply of photographic hypo (sodium thiosulphate) should always be kept on hand.

The sooner poisoned animals are treated the greater their chance of recovery. Immediately you find a beast suffering from arsenical poisoning, drench it with 2 oz. of photographic hypo dissolved in 1 pint of water. Continue drenching at intervals of four hours for two days. If the beast has not commenced to feed at the end of the second day, continue drenching for another day. If the poisoning effect continues, the animal may not feel inclined to eat for some time. In this case, dose three times a day with 1 gal. of milk in which 3 lb. of sugar have been dissolved.

A veterinary surgeon should be called at the first sign of arsenical poisoning and he has drugs and skill at his command which will increase the chance of recovery. It is most important, however, that any treatment must be commenced at the earliest possible moment.

—*K. M. GRANT, Assistant Director of Veterinary Services.*

Avoid Using Crossbred Boars.—Use of crossbred boars in the piggery is unwise. On occasions there are good reasons for using crossbred sows, but crossbred boars will eventually produce a wide diversity of types.

Most farmers are aware that hybrid vigour in crossbred pigs generally leads to faster growth. Taking this a stage further, the progeny of matings between a purebred boar and crossbred sows would retain the advantages of crossbred vigour and yet be reasonably uniform in type.

But if you use a crossbred boar you are likely to fill your piggery with a number of different types of pigs. Then you will have all the complications arising from a multiplicity of breeds.

Where one or two breeds only are involved, the pigs in a litter are usually sufficiently uniform to go forward to market about the same time. Where a crossbred boar is used, especially over crossbred sows, there is little uniformity in the litters. It is even likely that you will be marketing porkers and light, medium and heavy baconers from the same litter at the one time. This multiplicity of types gives the farmer a lot of extra bother in yarding and sorting them to keep all those of one type and size together.

Farmers who take pride in breeding an even line of baconers cannot do this successfully when they have a crossbred sire. If you want to develop a good type of pig, the easiest and quickest way is to use a first-class purebred boar. Purebred sires are the result of a planned breeding programme, not chance matings. If you buy your boar from a reputable stud, you can be reasonably sure that he will bring a measure of uniformity and correct type into your herd. At all costs, resist the temptation to buy crossbred boars at apparent bargain prices.

—*F. BOSTOCK, Senior Husbandry Officer, Pig Branch.*

Breeding Your Own Pigs.—Costs of pig production are influenced greatly by the number of pigs reared to pork or bacon weights from a litter. Those of you who breed your own pigs can improve results considerably by observing a few simple rules.

For a start, you should keep only those sows which farrow and rear large litters of healthy pigs. Sow upkeep is much the same for one with 10 pigs as for a sow with only six or seven, but the cost per weaner reared is lower in the larger litter.

Correct sow management, including mating at the right time, helps to keep up litter numbers.

Once the sow farrows your aim should be to keep losses of young pigs to a minimum. A warm, dry shed and access to clean pasture and a creep will give little pigs a chance to thrive, and avoid disease and parasites. Adequate feeding of the sow will also help.

By castrating early, and taking normal precautions on cleanliness, you should not have any losses or setbacks in the litter at this time.

Before they are eight weeks old, have the suckers eating the ration they will get as growers, and at weaning time take the sow away altogether.

Plan ahead to have ample feed on hand when you have pigs to finish as porkers or baconers.

Normal precautions against disease and parasites, together with good housing and adequate feeding after weaning, will ensure that you put a finish to a job begun well.

—*T. ABELL, Senior Adviser, Pig Branch.*

Test Pigs Show Promise.—An encouraging report has been made on the first four teams of pigs tested at the Agriculture Department's new Rocklea Pig Testing Station. Average daily weight gains, times to reach slaughter weight, and carcass appraisal reached a very high standard. The station has vacancies for test pigs and applications are invited from studmasters.

Three stud breeders are at present having their stock tested. Several others have applied to have their boars tested later, but there is room for more.

Results of the first four teams of pigs slaughtered were: Average food conversion 2·79 lb. (certification standard 3·5 lb.); average daily gain 1·55 lb. (1·35 lb.); average number of days to complete the test 100 (115); and average carcass appraisal 71·7 per cent. (70 per cent.).

Mr. Clay said the aim of pig testing is to help stud breeders in selection for herd improvement. Test results are a measure of the pigs' utility value, and this measurement can be compared with international standards. Pig testing has been centralised at the Rocklea station to even out differences in environment at the various studs.

Standardisation of the feed mixture, management and environment (which involves providing year-round uniform temperature and humidity in a very variable climate) made construction of the special test centre essential. The pig testing station has been specially designed and well insulated and equipped to ensure control of the environment.

Feeding and management of test pigs under uniform conditions not only evens out the effect of different environments on the carcass: it also makes it possible to determine the comparative food requirements to make 1 lb. of liveweight gain in pigs of different breeding. In itself, this is an important indication of the worth of the animals tested.

Stud breeders wishing to have their stock tested should apply as quickly as possible. Application forms may be obtained from district Pig Branch advisers at the Brisbane, Beaudesert, Warwick, Murgon, Biloela and Atherton offices of the Department of Agriculture and Stock.

—*A. L. CLAY, Director, Division of Animal Industry.*

pray To Eradicate Pig Lice

y D. B. HARRIS, Adviser, Pig Branch.

Why let pigs be tortured by the biggest of all e that infest domestic animals? The remedy is mple, inexpensive and effective.

Pig lice are so common that they are often condered as one of the evils that must be endured. nese sucking insect parasites, however, are so sily controlled that there is little excuse for ting pigs suffer from the constant irritation they use, or for the owner to put up with the loss ey occasion. The loss in heavily infested herds considerable.

The lice feed frequently and puncture the skin a different place at each feeding, and the fected animal will rub itself against posts or the de of the pen. Constant rubbing produces sores at do not heal because the lice congregate ound the raw tissues and keep them irritated.

Lice eggs can be readily seen attached to the ir behind the ears, and along the underline. dult lice move all over the animal's body but nerally are found on the softer portions along e underline and the forequarters.

Sprays containing benzene hexachloride, readily obtainable, control and eradicate pig lice most effectively.

In treating pigs for lice the entire herd should be treated regardless of the number showing infestation. Spraying only those that appear infested will not eradicate lice, as any member of the herd may at any time carry the lice.

Regular sprayings at 10-day intervals will not only eradicate lice but also control mange, another hazard to pig producers.

Give the floors and walls of sleeping quarters a thorough wetting to kill any lice that have been dislodged from animals.

The use of sump oil sprays, while keeping lice and mange to a reduced level, will not eradicate the trouble. Thorough treatment with the spray mentioned is the most efficient method for control of these parasites.

* * *

Lucerne Tops Grazing Trial

Lucerne easily retained its crown as king of fodders a 7-year trial just ended at the Agriculture Department's Biloela Regional Experiment Station. This longrm study has shown that irrigated lucerne will outeld irrigated grazing crops by almost two to one,

The Minister for Agriculture and Forestry (Hon. O. Madsen, M.L.A.) said the trial proved beyond oubt that in central Queensland and under irrigation cerne was more rewarding than annual grazing crops. it under other conditions, annual grazing crops will ll have an important part to play.

A report on the trial by Mr. G. H. Allen, Senior gronomist, records that in the 7 years lucerne gave grazings. The yield was 46 tons of hay to the acre. nnual fodder crops of oats and field peas in winter id cowpeas or mung beans with giant setaria in summer gave 40 grazings. The yield was 24 tons of hay to the acre.

Lucerne made the bulk of its growth in the summer. Its summer production of 4.6 tons of hay to the acre was double the winter yield. Summer and winter production from annual crops was much more even, at 1.9 tons an acre in summer and 1.6 tons in winter. It is well to remember that the land under annual crops was out of production for at least one-third of each year while it was being prepared for the following crop.

Throughout the 7 years of the trial, lucerne consistently contained 20 to 25 per cent. of protein with an average of 23 per cent. Annual crops range in protein from 9 to 25 per cent., with an average of 17 per cent.

Tuberculosis-Free Cattle Herds

(As at 1st September, 1960)

Aberdeen Angus

Crothers, G. H. & H. J., "Moorenbah", Dirranbandi
Elliott, A. G., "Ooraine", Dirranbandi
Mayne, W. H. C., "Gibraltar", Texas

A.I.S.

Cox, T. L. & L. M. J., Seafield Farm, Wallumbilla
Crookey, J., Arolla A.I.S. Stud, Fairview, Allora
Davis, W. D., "Wamba", Chinchilla
Dennis, L. R., Diamondvale A.I.S. Stud, Mundubbera
Edwards Bros., "Spring Valley" A.I.S. Stud, Kingaroy
Evans, E. G., Lauraven A.I.S. Stud, Maleny
Green, D. B., Deloraine A.I.S. Stud, Fairdale
Heading, C. A., "Wilga Plains", Maleny
Henry, Mrs. K., Greenmount
Henschell, W., "Yarranvale", Yarranlea
H. M. State Farm, Numinbah
Littleton, H. V., "Wongalea", Hillview, Crow's Nest
Marquardt, A. C. & C. R., "Cedar Valley", Wondai
McShane, A. H., Handford Road, Zillmere
Mears, G. S. & E., "Morden", M. S. 755 Toogoolawah
Moore, S. R., "Sunnyside", West Wooroolin
Neale, D. G., "Groveley", Greenmount
O'Sullivan, Con., "Navillus", Greenmount
Pinwill, A. A., Gaylands A.I.S. Stud, Gayndah
Power, M. F., "Barfield", Kapaldo
Messrs. Mitchell and Mulcahy, Rosenthal
Queensland Agricultural High School & College, Lawes
Radel, R. R. & Sons, "Happy Valley", Coalstoun Lakes
Roche, C. K., Freestone, Warwick
Sanderson, W. H., "Sunlit Farm," Mulgildie
Schloss, C. J., "Shady Glen", Rocky Ck., Yarraman
Scott, M. E. & E., "Wattlebrae" A.I.S. Stud, Kingaroy
Scott, W. & A. G., "Walena" A.I.S. Stud, Blackbutt
Shelton, R. A. & N. K., "Vuegon" A.I.S. Stud, Hivesville, Murg
Estate Sokoll, A. H., "Sunny Crest", Wondai
Sperling, G., "Kooravale", Kooralgin, Cooyar
Sullivan Bros., "Valera", Pittsworth
Sullivan, D., "Bantry", Pittsworth
Sullivan, F. B., "Fermanagh", Pittsworth
Thompson, W. H., "Alfavale", Nanango
Webster, A. H., "Millievale", Sabine, via Oakey
Wieland, A. W., "Milhaven", A.I.S. Stud, Milford, via Boon

Ayrshire

Dudgeon, C. E. R., Marionville Ayrshire Stud, Landsborough
Dunn, T. F., "Alanbank", Gleneagle
Goddard, B., Inverell, Mt. Tyson, via Oakey
Holmes, L., "Benbecula", Yarranlea
Mathie, E. & Son, "Ainslie", Maleny
Scott, J. N., "Auchen Eden", Camp Mountain
Zerner, G. F. H., "Pineville", Pie Creek, Box 5. Post Offi
Gympie

Friesian

Behrendorff, E. C., Inavale Friesian Stud, M.S. 786, Boonah
Macdonald, S. E. G., "Freshfields", Marburg
Naumann, C. H., "Yarrabine", Yarraman
Pender, D. J., Lytton Road, Lindum
Stumer, A. O., Brigalow, Boonah

Guernsey

Doss, W. H., Degilbo, via Biggenden
Fletcher, A. B., "Cossart Vale", Boonah
Holmes, C. D. (owner Holmes L. L.), "Springview", Yarraman
Johnson, G. L., "Old Cannindah", Monto
Miller, G., "Armagh Guernsey Stud", Armagh, M.S. 428, Grantham
Ruge, A. & Sons, "Woowoonga", via Biggenden
Scott, C., "Coralgrae", Din Din Rd., Nanango
Swendson, A. C., Coolabunia, Box 26, Kingaroy
Wissemann, R. J., "Robnea", Headington Hill, Clifton

Jersey

Beckingham, C., Trout's Rd., Everton Park
Birt, W. C. M., Pine Hill Jersey Stud, Gundiah
Borchert, Mrs. I. L. M., "Willowbank" Jersey Stud, Kingaroy
Burrows, R. N., Box 23, Wondai
Bygrave, P. J. L., The Craigan Farm, Aspley
Carpenter, J. W., Flagstone Ck., Helidon
Conochie, W. S. & Sons, "Brookland", Sherwood Rd., Sherwood
Crawford, R. J., Inverlaw, Kingaroy
Farm Home For Boys, Westbrook
Fowler, P. & Sons, "Northlea", Coalstoun Lakes
Harley, G., "Hopewell", M.S. 189, Kingaroy
H.M. State Farm, Palen Creek
Hutton, D. R., "Bellgrath", Cunningham, via Warwick
Johnson, H. G., Windsor Jersey Stud, Beaudesert
Lau, J. F., "Rosallen", Goombungee, Toowoomba
Matthews, E. A., "Yarradale", Yarraman
McCarthy, J. S., "Glen Erin", Greenmount, Toowoomba
Meier, L. E., "Ardath Stud", Boonah
Noone, A. M. & L. J., "Winbirra", Mt. Esk Pocket
Porter, F., Conondale
Q.A.H.S. & College, Lawes
Ralph, G. H., "Ryecome", Ravensbourne
Scott, Est. J. A., "Kiaora", Manumbar Rd., Nanango
Semgreen, A. L., "Tecoma", Coolabunia
Seymour, B. T., "Upwell" Jersey Stud, Mulgildie
Smith, J. A. & E. E., "Heatherlea" Jersey Stud, Chinchilla
Tatnell, W. T., Cedar Pocket, via Gympie
Toowoomba Mental Hospital, Willowburn
Verrall, F. W., "Coleburn", Walloon
Weldon Brothers, "Gleneden" Jersey Stud, Upper Yarraman

Poll Hereford

Anderson, J. H. & Sons, "Inverary", Yandilla
Hill, W. W., Mathalla
Hutton, D. R. & M. E., "Bellgrath", Cunningham, via Warwick
Maller, W., "Bore View", Pickanjinnie
Maller, W., "Bore View", Gowrie Junction
McCamley, E. W. G., "Eulogie Park", Dululu
Wilson & McDouall, Calliope Station, Calliope

Poll Shorthorn

Leonard, W. & Sons, Welltown, Goondiwindi
Yamburgan Pastoral Company, Noondoo

bucket and bail

Correct Belt Tension.—Slack engine belts can e responsible for variations in cream tests and or lowering cream quality.

The engine belt drives the vacuum pump, pul- ators, separator and, in some cases, a skim-milk ump or a home lighting generator.

A loose belt will slip when the full load is pplied at milking time and this will reduce he rate of milking and the speed of the separator.

Slow separator speeds reduce the test and the uality of the cream because cream deteriorates nore rapidly as the test is reduced.

If separating is still in progress when milking is nished, the separator speed increases because he belt ceases to slip when the load of the vacuum ump and pulsators is removed. This increase n speed will again bring about a variation in test nd may affect the quality of the cream.

Flat leather belts are better than canvas-rubber composition belts because they do not vary so nuch in length with weather changes. Flat belts hould be fairly long and, when in motion, the pper half of the belt should be the slack portion nd should have sufficient slack to allow the entre to be moved up and down about one inch. V belts should grip the sides of the pulley V and hould not touch the bottom of it. "Brammer" elting must travel in the correct direction. The utside end of each segment points in the direction f travel.

You can avoid variations in cream tests and ream quality as well as improving the overall fficiency of your milking machines by regularly djusting the tension of the belts.

—*R. R. FANNING, Dairy Officer.*

Champion Keeps Going.—Champion A.I.S. ow at the 1957 R.N.A. Exhibition has been admitted to the Elite section of the Register of Merit for dairy cows. She is Sunny View Thelma 39th, owned and bred by Messrs. J. Phillips and Sons, of Sunny View, Kingaroy. She is the ninth dairy cow in Queensland to qualify for the elite section.

Thelma's entry into the elite section of the register was announced by the Minister for Agriculture and Forestry (Hon. O. O. Madsen, M.L.A.). Until May, 1960, when three of the cows completing lactations qualified, no cows had been admitted to the elite section of the register for two years.

Mr. Madsen said Thelma had yielded 38·8 tons (86,943 lb.) of milk and 1·8 tons (4,056 lb.) of butterfat in five milking seasons. The average test of her milk was 4 per cent. of butterfat. Her butterfat yield is equivalent to 4,946 lb. or more than 88 boxes of commercial butter.

Thelma was born in July, 1953, and still has many years of production ahead of her. If she continues to produce at her present level, she could easily yield something in the region of 7,000 lb. of butterfat in her lifetime. It is certain that farmers will watch her future yields with interest.

Mr. Madsen said that a tenth cow had also been admitted to the elite section. She is Lauraven Mermaid, an 11-year-old A.I.S. cow who has produced 3,640 lb. of butterfat in nine lactations. She has yielded 95,999 lb. of milk with an average butterfat test of 3·8 per cent. Mermaid is owned by her breeder, Mr. E. G. Evans, of Maleny.

To qualify for entry into the elite section of the register, a cow must produce at least 3,600 lb. of butterfat in not more than 10 lactations.

Holidays.—The following item appeared in a popular primary producers' paper recently: "*A Change.*—This week at the seaside we met a number of families down from the country. We watched their children and the parents put on weight and take a new lease of life. It emphasised the importance of the holiday in the life of country dwellers, whether they are employers or employees. Surely there is nothing so refreshing to the average family as a holiday by the sea—so much so that everything possible should be done to make their holiday a regular yearly event."

This article stresses one of the advantag claimed by officers of the Department of Agr culture and Stock in respect to seasonal calvin for dairy cows.

This practice not only allows the farmer an his family to have a yearly holiday at the seasid but also contributes towards the expense Calving all the herd in the months of the yea most favourable for higher yields increases th production of the herd at no additional expens to the owner. Adopt seasonal calving and hav an annual seaside holiday.

—*S. E. PEGG, Chief Adviser, Herd Recording.*

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Tractor Testing In Australia—II

By G. H. VASEY,
Officer in Charge of Tractor Testing,
and W. F. BAILLIE,
Testing Officer, University of Melbourne.

Australian test procedures*, though differing in some details, and in some ways going further and telling more about the tractor, conform in essentials to overseas standards.

The tests are in four main parts:

(*a*) the physical properties of the tractor;

(*b*) the power of the engine, and its stationary outlets—the belt and the p.t.o.;

(*c*) the power on the drawbar when working on a formalised test surface or track;

(*d*) the reliability of the tractor when running under test, and its condition after the test.

1. PHYSICAL PROPERTIES

The first thing is the identification of the tractor, from engine number to weights and dimensions; checking the fuel pump delivery, analysing the fuel used in the tests. Among the dimensions, for example, are the ground clearance, length, width and height.

The position of the centre of gravity is found, turning circles are run and measured. P.t.o. speed and style are compared with international standards; so also is the linear speed of the belt.

The wheel equipment is examined, added ballast checked; the total weight and tyre pressures are checked against the weight recommended for use in the field.

If the tractor works through an automatic linkage that can continually support an implement while at work, a static test is run to decide what ballast may fairly be added to the (light weight) tractor, so as to represent in the test the weight transferred from the implement.

The seat and controls are tried for accessibility and comfort; the usefulness of the instruments is noted throughout the running of the tests.

The sum total of these critical observations, and the reporting of them are an important part of the treatment, since they represent those features of the tractor that the user is immediately concerned with. Most users are rightly more interested in these than in the power output, provided the power is enough.

But if the tractor is uncomfortable, noisy, hard to steer, awkward to handle, inconvenient in its controls, then the user of it has to put up with a lot of hardship all the time he is on it, even though it may do his work for him.

2. THE POWER UNIT

Since the modern tractor is in effect a mobile power plant, with a power unit—the engine—and several power outlets in the belt pulley, p.t.o., hydraulics and drawbar, it is important to know the performance of the engine itself, the source of power.

Though the power put out by any of the outlets must necessarily be less than the corresponding power of the engine, the performance of an outlet will of course reflect and correspond to the performance of the engine.

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* The Tractor Testing Committee, which controls the Australian scheme, is a joint body established by agreement between the Commonwealth, the States, and the University of Melbourne; under this agreement, the tests are carried out by the University of Melbourne. The address of the Tractor Testing Committee is: care of Department of Primary Industry, 301 Flinders Lane, Melbourne, Victoria.

(a) Full Power at Rated Speed

The first step therefore is to measure the performance of the engine itself. For this purpose the engine, complete with all auxiliaries and controls, is taken out of the tractor, set up on a test bed, and direct coupled to the torque dynamometer. In this way the torque* on the engine shaft, and the power output at the engine shaft (shaft horsepower, s.h.p.)† are directly measured. Maximum engine power is established by running a test for two hours, at full power (that is, the fuel supply not restricted by the governor) at rated speed, shown at A in Plate 1.

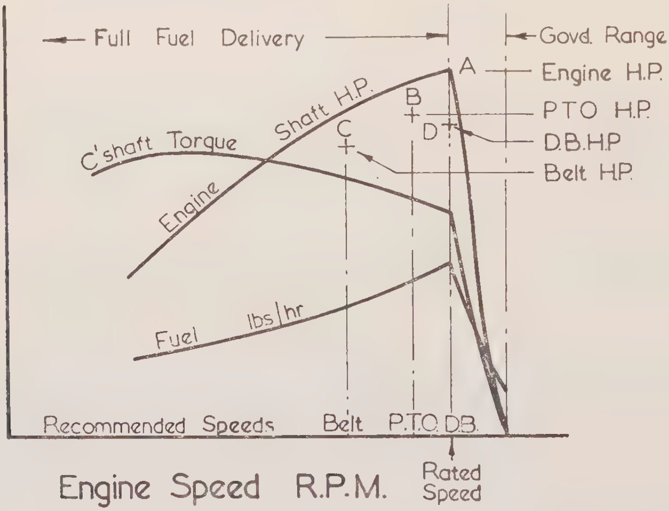


Plate 1

Performance of Engine and Outlets.

NOTE 1. Engines of the Same Model not Identical

For any production model of engine (or tractor) the maximum power output at rated speed of the individual units cannot be exactly the same; over the whole production or stock there must be a variation, that might amount to plus or minus 5 per cent.—in effect a manufacturer's tolerance. Since the top value of this range can be reached only by perhaps 1 in 50 engines, to quote the top value alone is doubly misleading—it implies that all engines are alike; and all at top value.

To bring the test to realities, it is sufficient to see whether the maximum shaft h.p., found in the test just described, on the random sample, falls within the range of expected values nominated by the manufacturer. The manufacturer is asked, in the Conditions of Test, to nominate this range. This test therefore is in the true nature of a formal acceptance test.

NOTE 2. Avoid "Bare Engine" Power

Some engine companies are apt to quote what they call brake h.p. on the bare engine, that is without fan and generator, and possibly without water pump. Since these essentials may account for 3 or 4 h.p. in a 50 h.p. engine, the value is misleading (and confusing, even if the term "bare engine" is employed to make the meaning clear).

NOTE 3. Avoid "Brake" H.P.

A further confusion comes from the use of "brake h.p." Brake simply means that the power is absorbed and measured on a torque brake or dynamometer, as it always is. The important thing to say is where, on the engine or its outlets, he power is measured. Hence shaft h.p. (better han flywheel h.p.) is the only proper term for his. There is no occasion for brake h.p., or for .h.p. since this may be confused with belt h.p.; or this latter it is better to spell it out, as belt h.p.

---

*TORQUE in the shaft is the twisting moment that drives things connected to the shaft. It is the product of tangential force and radial distance from the centre of the shaft; for example, any combination of force and distance whose product is say 100, means a torque of 100 ft. lb.

†POWER in a shaft is the product of torque and rotational speed. In horse-power units, shaft horsepower (s.h.p.) = 2π × torque × speed (r.p.m.) ÷ 33,000. This comes to s.h.p. = torque × speed ÷ 5,250.

VOTE 4. Rated Speed Important

A speed of special importance in governed ngines is rated speed; this is the speed nominated y the maker (usually in round numbers like ,600, 1,750, 2,200 r.p.m.) as the recommended peed for running more or less continuously at ull output. Maximum power, as a characteristic neasure of governed engine performance, is only neaningful when measured and quoted at rated ngine speed; its full title is "Full-power-at-rated-peed."

VOTE 5. Fast Idling Setting of Governor

For the purposes of formal test, it is essential o establish full, or maximum power in this way, amely at rated speed; this is so, notwithstanding he practice sometimes employed of providing fast-idling setting in the governor that may ring the engine on to full power at above rated peed. This fairly ensures that full power is vailable at rated speed, perhaps with something o spare; but the procedure is not intended to ake any account of the "something to spare". Equally fairly, if the fast idling setting does ot yield full power at rated speed, the etting will be raised accordingly.

b) Governed Speed Running

At part loads, the governor takes over, allowing the speed to rise eventually—at o load—to fast idling speed. A series of ests is run, at part loads, to see how speed and fuel consumption vary under the governor. This is called running under the governor, or in the governed range, shown to the right of rated speed in the graphs of Plate 1.

(c) Full Fuel (Full Throttle) Running

Starting again at full load and rated speed, as the load, that is, the torque, is still further increased, the governor keeps he fuel open, so the speed will fall, down o the lowest available speed. At about half rated speed of the torque output will reach ts maximum; maximum torque and the rise n torque output from full load at rated speed are points of some interest, since hey indicated "lugging" capacity.

A series of tests is run in this region of performance so as to establish the full torque characteristic shown to the left of rated speed in Plate 1.

(d) Part Loads, Lower Speeds: Best Economy

By resetting the governor at a succession of lower speeds, the whole part-load performance of the engine can be traversed so as to reveal that combination of load and speed that gives best economy, a point of some interest when farm tasks require only a fraction of the full output of the engine.

NOTE 6. Fuel Consumption—Specific Fuel Consumption

Fuel consumption is measured during all of these tests; this is stated in the report in a variety of ways.

Though the simplest unit may be gallons per hour, this takes no account of load or whether the engine is doing much or little work at the time. A much better indication of fuel performance is the specific fuel consumption: this is quoted in lb. per s.h.p.-hour, which should be low for good economy, or s.h.p.-hour/gallon, which of course should be high.

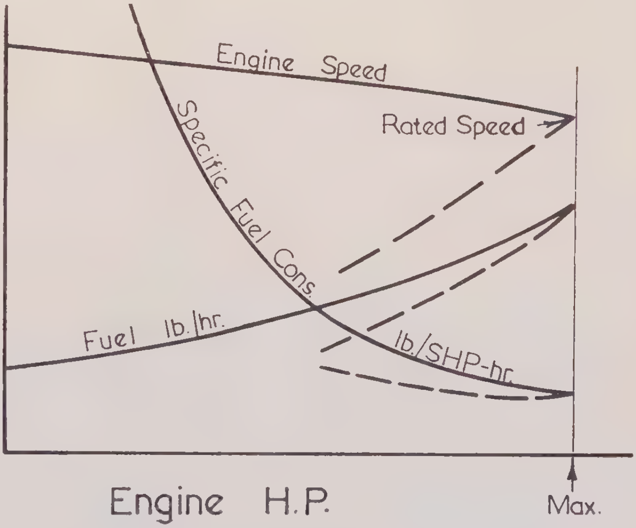


Plate 2

Engine Performance. In governed range shown as continuous line; at full fuel delivery shown as broken line.

Specific fuel consumption enables us to compare the economy not only of one engine at various loads; but of one engine with another regardless of differences in type and size. How specific fuel consumption varies with power output on both governed and full throttle running is shown in Plate 2.

3. OTHER STATIONARY OUTLETS— P.T.O. AND BELT

(a) P.T.O. Power

When the engine has been put back into the tractor, a full power test on the p.t.o. outlet is run, that is, with the p.t.o. direct coupled to the dynamometer, and with the governor control set to run the engine at full power at the speed required to give the specified or standard p.t.o. speed. (This engine speed may or may not be rated speed.) This test is shown as the single point B in Plate 1.

(b) Belt Power

Similarly by coupling the belt pulley to the dynamometer by a suitable belt, a single test of full power on the belt outlet is run; again the governor control may have to be reset so as to run the engine at the speed recommended for belt work, or at the speed required to run the belt at the standard linear speed (3,100 r.p.m.). This test is shown as the single point C in Plate 1.

NOTE 7. Change in Test Codes

In other testing stations, and in the Australian tests up to 31, the belt outlet was used as the only means of testing the engine. Other testin stations use, or shortly will use the p.t.o. instea of the belt outlet as the main test; if there is n p.t.o., then the engine will be tested directl on the crankshaft as described above. Clearl the trend is away from the belt outlet an towards the direct engine test as the main te in the series.

NOTE 8. Ambient Conditions during Test

Throughout the tests, especially the longer run of 20 min., 1 hr., and 2 hr., the temperatur and barometric pressures of the ambient air a observed, as well as the temperature of th radiator water, and of the lubricating oil an fuel. It may be necessary to avoid testing, a any rate for the purpose of establishing maximu power, on days that are particularly hot c particularly cold. On the other hand, it woul be fair to introduce a test at high air temperatur say 100 deg. F., to see how performance ma suffer in the hot weather.

4. TESTS ON THE DRAWBAR

(a) Introduction

Drawbar power is, by definition, the produ of pull and speed; in particular d.b.h.p. = Pu (lb.) × Speed (m.p.h.) ÷ 375. To apply drawbar load to a tractor it is necessary onl to cause it to pull something.

For test purposes the load is a special vehic whose resistance to pulling can be varied at wi (rather like applying a brake to the towe vehicle). The pull in the towbar is measure

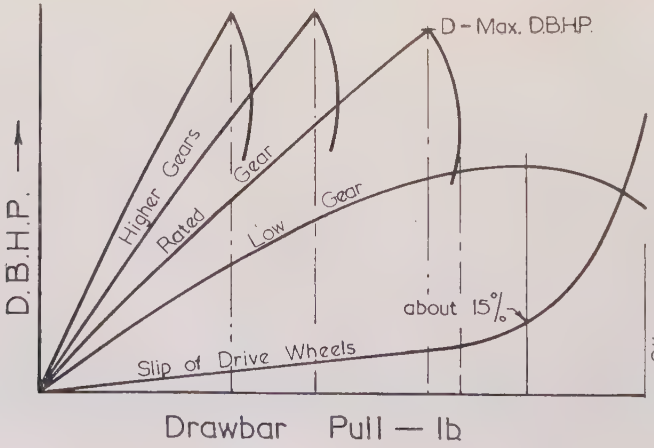


Plate 3
Drawbar Performance in the Gears.

for example by a hydraulic cylinder and pressure gauge, while speed is measured by timing the tractor over a measured course on the test track. In any event, no statement about d.b. power and pull are meaningful unless the weight of the tractor (total and rear axle loads) and height of drawbar are also quoted.

(b) Test in Each Gear

For each gear (except the high speed road gear) in a series of runs over measured courses of 200 to 500 ft., the load is steadily increased until full engine power and rated engine speed are reached. As the pull is still further increased, the speed will fall rapidly corresponding to the full torque/speed characteristic of the engine, until a maximum sustained pull is reached, corresponding to maximum torque in the engine.

These characteristics of d.b.h.p. are shown in Plate 3 for the several gears (above the low gears that will be mentioned) by the sloping lines leading to the peaks, followed by the hooks down to and past the maximum sustained pulls.

(c) Maximum d.b.h.p. defined by Rated Gear

Although these peaks of d.b.h.p. in the various gears may not be equal in value, it is the peak in rated gear that defines, for the tractor, the maximum d.b.h.p., where rated gear corresponds to the speed of heavy farm work, for example ploughing, at about 3 m.p.h.

It will be noted that maximum d.b.h.p. will be less than maximum engine power: naturally, because of the losses in the transmission and in the wheels, including slip: point D in Plates 1 and 3.

(d) Low Gear Output Limited by Slip

An exception to this behaviour will (usually, that is, unless the tractor is specially and improperly heavily weighted for the purpose of the test) appear in the low gear or gears, where the heavy pulls cause the wheels to fail by slip before the engine is fully loaded; in those circumstances neither full engine power, nor full d.b. power is reached. This situation is shown by the low curve in Plate 3. Nevertheless, it is usual for the pull at the "hill" of this curve to be higher than the pulls available in the higher gears.

(e) Ten-hour Test

Rated gear is then chosen for a much longer run—the 10-hr. test, still on the test track. In the original Nebraska tests, this run of 10 hr. was done under a fairly high drawbar pull—three-quarters of maximum for the rated gear. The idea was to see whether the tractors could run continuously for that long—many of them failed to do so.

The Australian test splits it up into 4 x 2½-hr. sessions, the sessions being run at four different loads from nearly full load down to below half load. Clearly in modern tractors, this arrangement does not particularly look for failure in 10 hr. of running, but gives values of fuel consumption at a variety of likely loads on 2½-hr. runs.

NOTE 9. Warning on Drawbar Values

Performance on field soils, unless they are hard and dry like the test track, will be different from the performance measured in the test: pulls will be less and slip more. Plate 4 suggests the sort of differences in pull, slip and d.b.h.p. that might arise in a given gear on some unspecified soil.

5. RELIABILITY DURING TEST: FINAL INSPECTION

Before the test is started, the tractor, being new, is given the usual pre-sale checks and treatment such as the vendor is supposed to give for the purchaser; and, being new, the tractor is run-in for an arbitrary period of 12 hr. before applying the formal tests.

Defects and mishaps that occur at any time during the tests, requiring adjustments or replacement of parts, are of course corrected and noted in the record.

New oil is charged to the engine after run-in, and drained out at the end of tests, the weight of oil at start and finish being noted. Similarly the weight of cooling water added during the tests is noted.

The total time of running is added up from the daily logs; in an average test this would amount to 50 or 60 hours, including run-in.

After the tests, the tractor is partly stripped down: the engine head and sump removed, valves and pistons withdrawn, transmission covers taken off, so that any obvious signs of undue wear or overheating can be detected after so many hours of running.

6. TEST REPORT

The whole series of events is recorded in a formal report which would show in tables the full power values on the crankshaft and at the outlets, as well as the performance shown in the graphs of Plates 1, 2 and 3, and other graphs also. As well as giving a brief specification of the tractor, the report will state the manufacturer's expected range of values for full engine power for this model.

While the information on the properties the proportions of the tractor, and on the tests of the engine and its stationary outlets, will need no particular interpretation (they will behave the same way in general use), tests on the drawbar must be interpreted in the light of Plate 4 and Note 9.

Though the Technical Report is limited i numbers, the briefer Farmers' Edition is readil available throughout Australia, and State Departments of Agriculture and offices of the Department of Primary Industry.

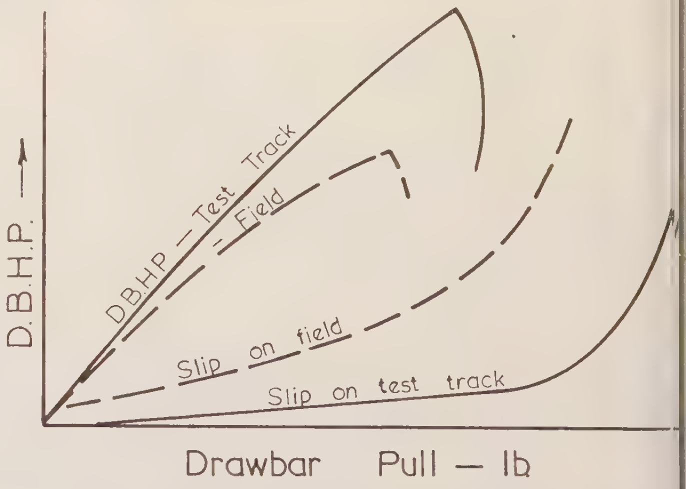


Plate 4
Typical Difference Between Test Track and Field.

* * *

Studs' Record Testing Year

More stud dairy cattle than ever before were tested in the purebred dairy cattle production recording year just ended, the Minister for Agriculture and Forestry (Hon. O. O. Madsen, M.L.A.) said. The 3,078 cows' production recorded represented a 33 per cent. increase on the 1958-59 total. They came from 153 herds.

Average production of the 2,971 cows that completed a full milking season was 645 gallons of milk containing 282 lb. of butterfat. This is equal to 340 lb. of commercial butter. Of the cows that completed lactations, 989 yielded sufficient butterfat to reach or exceed the age standards for entry into the advanced register o the various herd books.

During the year, several new production records were established for the various ages an breeds. The outstanding performance was tha of a mature A.I.S. cow, Kenstan Opal 7th. Sh set a new record of 1,060 lb. of butterfat in 30 days. The butterfat was contained in a mil yield of 25,220 lb., or 11 tons. The recor number of herds and cows submitted for production recording last year showed that stu breeders were recognising the need for accurat records of their herds' performances.

Fordson Delta, Rowcrop Model

Australian Tractor Test No. 32A

Following is an abridged report of the Australian Tractor Testing Committee on the Fordson Delta, Rowcrop Model:

The tractor used in test No. 32 was converted o the Rowcrop model by the fitting of the alternative wheel equipment.

Minor modifications to front axle, steering, and mudguard mountings were made with standard parts supplied by the Ford Co. from stock. A winging drawbar was fitted.

Performance Summary

1. Governed engine speed: 2000 r.p.m.
2. Maximum* belt h.p., rated speed (Test No. 32): 30·0.
3. Max.* d.b.h.p. on test track, rated engine speed: 27·5
4. Rated† d.b.h.p. under governor control: 21
5. Maximum shaft h.p. at rated speed: 33·0.

Steering, Stability

Track width as tested: front 53 in., rear 53 in.; wheelbase 74 in.

Turning Circles: outside diameters on consolidated gravel surface:

No brakes: L.H. and R.H. 21 ft. 4 in.

With brakes: L.H. and R.H. 17 ft. 4 in.

Steering: Manual, easy and sensitive at all loads.

Centre of Gravity: 3½ in. below, 23½ in. ahead of rear axle; tested in maximum weight condition including driver and fuel; rear 3,220 lb.; front 1,500 lb.; total 4,720 lb.

Ground Clearance: Without swinging drawbar—20 in. With swinging drawbar—15 in.

Height of Drawbar: 16½ in.

Tyres, Wheels and Weights

1. *Rear Wheels :*	
Type	Pressed centres, detachable rims
Ballast :	
Liquid, lb./wheel	370*
Iron, lb./wheel	75*
2. *Rear Tyres :*	
Size and ply	11 x 38, 6 ply
Make and Type	Dunlop Super Trakgrip open centre chevron tread
Air pressure, p.s.i.	12
Static Deflection	1⅜ in.
3. *Front Wheels :*	
Type	Pressed assembly
Ballast :	
Liquid, lb./wheel	Nil
Iron, lb./wheel	75
4. *Front Tyres :*	
Size and ply	6·00 x 16, 6 ply
Make and Type	Dunlop Farm Tractor Circular rib tread
Air pressure, p.s.i.	28
5. *Weight of Tractor :*	
Rear axle, lb.	3,220
Front axle, lb.	1,500
Total (as tested with operator), lb.	4,720
6. *Weight Condition :*	Maximum†
7. *Height of Drawbar :*	16½ in.

* Equivalent to 90% liquid (anti-freeze) ballast.
† Maximum recommended weight.

---

* No atmospheric corrections are applied to diesel engines.

† *Rated drawbar h.p.* is defined as 75 per cent. of maximum d.b.h.p.

DRAWBAR TESTS. Tractor running on Tarmac Test. Note: One fuel setting in all tests.
Rated gear—2nd

Gear	At Rated Engine Speed					Overload			Temperature °F		Barom Inch Mercur
	D.B.H.P.	Drawbar Pull lb.	Speed m.p.h.	Slip of Drive Wheels %	C/Shaft r.p.m.	Max. Sustained Pull lb.	Limit Set By	C/Shaft Speed r.p.m.	Radiator	Air	
TESTS F. & G. MAXIMUM D.B.H.P.—All gears. Maximun weight, standard tyres. Rated gear—2nd defines max. d.b.h.											
1	20·2	3,750	2·02	13·6	2,150	4,000	wheelslip	2,150	165	55	30·0
*2	27·5	2,450	4·36	7·0	2,000	2,700	engine torque	1,300	165	55	30·0
3	28·9	1,875	5·78	5·4	2,000	2,100	engine torque	1,300	165	55	30·0
4	29·1	1,475	7·40	3·8	2,000	1,650	engine torque	1,300	165	55	30·0
5	29·1	850	12·85	1·7	2,000	950	engine torque	1,300	165	55	30·0
6	Not tested										

* * *

Farmers Can Now Tame Nutgrass

Queensland farmers now have a method of controlling nutgrass sufficiently for good crops to be grown. Developed at the Agriculture Department's Ayr Regional Experiment Station, the method combines strategic cultivation with hormone spraying.

The Minister for Agriculture and Forestry (Hon. O. O. Madsen, M.L.A.) said the cost is about £20 an acre for materials. This is not regarded as excessive if high value crops are grown because, with careful management, normal cropping can be resumed for two or three years.

He said nutgrass is one of the most troublesome weeds in cultivations. Because of the reserves of plant food it stores in its underground nuts, nutgrass can seldom be got rid of completely. But it is possible to reduce the number of live nuts in the top 6 in. of soil to a point where the nutgrass is no longer a serious competitor with the crop.

Nutgrass grows prolifically in the sandy soils of the Burdekin district. Sugar-cane will escape damage if it is grown quickly enough to shade the land, restricting nutgrass growth. This calls for fairly liberal fertilizing. If crops other than fast growing sugar-cane are to be produced another method of nutgrass control is needed.

This was supplied from a long term trial jus completed at the Ayr Regional Experimen Station. There it was found that many of th nuts in the top 3 in. of the soil would die i severed from their roots and exposed in the ho dry soil for a few weeks.

In the trials, the soil was ploughed and the disced at regular intervals during the dry seaso in spring and early summer. Counts showed that the number of live nuts was reduced by a average of 88 per cent. During the wet seaso in late summer, the land was sprayed severa times with 2, 4-D. By March, the number o live nuts in the soil was reduced by a further 9 per cent. At this stage, nut grass infestation had thinned out sufficiently for good crops to be grown.

It was realised that hormone sprays could no always be used because of the risk of damaging crops in nearby fields. Further trials showed that if this were the case, reinfestation of nutgrass could be checked by establishing a dense stand of cowpeas early in the wet season.

Queensland Fauna Sanctuaries

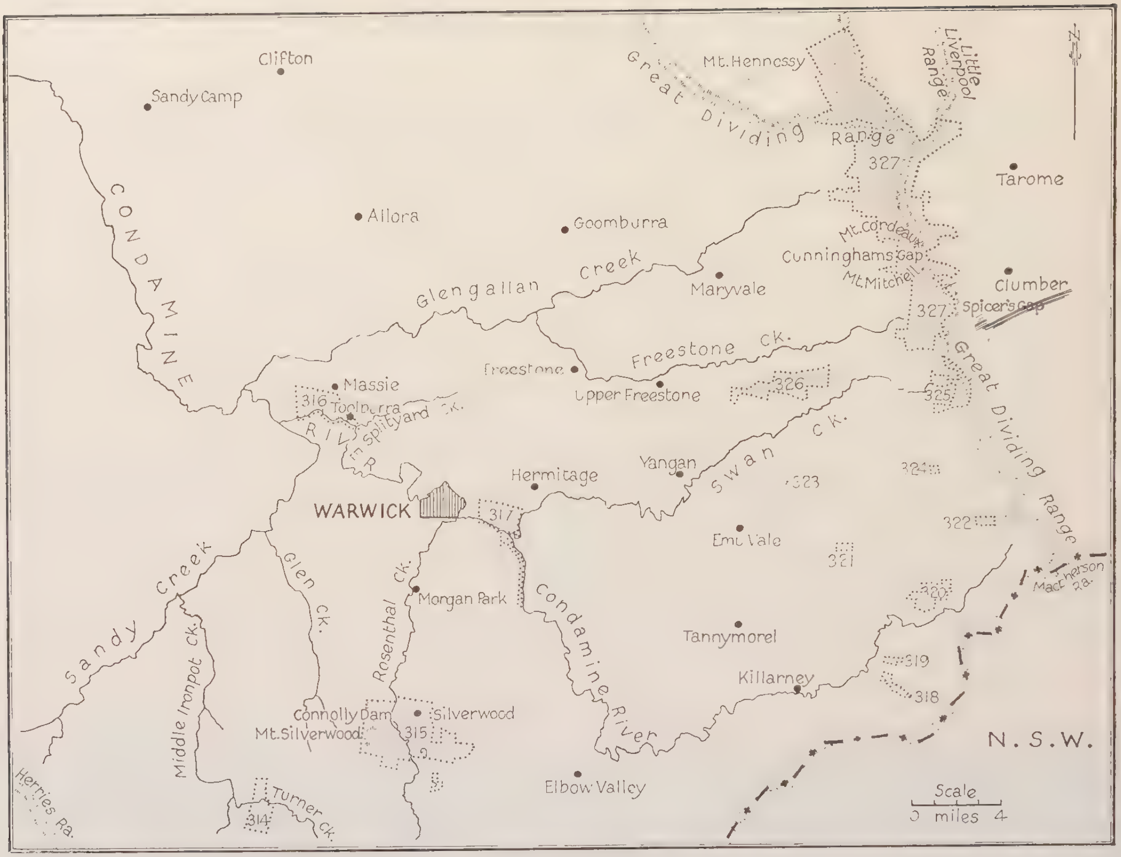
By C. ROFF, Fauna Officer

The following is an index of the sanctuaries outlined in Map 24.

dex No.	Sanctuary	Area in Acres
314	" Braeside," Dalveen	1,221
315	" Connolly Dam," Silverwood	5,400
316	Portion of " North Toolburra," via Warwick	2,130
317	" Canning Downs," Warwick	1,510
318	" Queen Mary Falls," National Park Reserve 569, Parish of Killarney, via Killarney	192
319	" Blackfellows Knob," National Park Reserve 452, Parish of Killarney, via Killarney	135
320	State Forest Reserve 400, Parish of Emu Vale, via Tannymorel	1,220
321	" Rocky Creek," National Park Reserve 115, Parish of Emu Vale, Emu Vale	157
322	State Forest Reserve 559, Parish of Emu Vale, via Emu Vale	258
323	National Park Reserve 550, Parish of Emu Vale, via Emu Vale	10
324	State Forest Reserve 560, Parish of Emu Vale, via Emu Vale	100
325	State Forest Reserve 401, Parish of Gilbert, via Yangan	1,600
326	Timber Reserve 402, Parish of Gilbert, via Yangan	1,830
327	" Cunningham's Gap," National Park Reserves 670, 705, State Forest Reserves 49, 327, 405, 750, Parishes of Gladfield, Gilbert, Fassifern, and East Haldon, via Cunningham's Gap	20,837

Plate 12

The Sanctuary near Spicer's Gap Provides Refuge for Koalas.


Clifton
Sandy Camp
Mt. Hennessy
Great Dividing Range
Little Liverpool Range
N
327
Tarome
CONDAMINE
Allora
Goomburra
Mt. Cordeaux
Cunninghams Gap
Mt. Mitchell
Glengallan Creek
Maryvale
Clumber
327
Spicer's Gap
Freestone
Freestone Ck.
Upper Freestone
326
325
Massie
316
Toolburra
Splityard Ck.
RIVER
Great Dividing Range
Swan Ck.
Yangan
Hermitage
324
323
WARWICK
317
322
Emu Vale
321
Sandy Creek
Glen Ck.
Rosenthal Ck.
Morgan Park
Condamine River
Macpherson Ra.
320
Tannymorel
Middle Ironpot Ck.
319
Killarney
318
Connolly Dam
Silverwood
Mt. Silverwood
315
N.S.W.
Herries Ra.
Turner Ck.
314
Elbow Valley
Scale
0 miles 4

Map 24

Map Showing Sanctuaries in Part of Fauna District No. 1. The sanctuary boundaries (as at December 31, 1957) are delineated by dotted lines enclosing the stippled areas.

* * *

Stop that Raindrop Erosion

A great deal of the erosion which occurs on cultivated land can be attributed directly to the pounding and puddling effect of raindrops on the bare soil.

When the soil surface becomes puddled the intake rate is reduced and the resultant run-off water carries away the soil already dislodged by the chiselling action of the raindrops.

It won't be long now before the spring and early summer storms commence and the erosion risk will increase. It is desirable to counter thi risk by avoiding fine fallows and by providing where possible a protective blanket of crops o crop residues.

It is a wise policy to avoid stubble burning and to preserve the crop residues as a surface mulch for the protection of the soil.

—*J. E. LADEWIG, Chief Soil Conservationist.*

orchard and garden

Water Young Citrus Trees.—Young citrus trees n an orchard need frequent watering. Newly planted citrus trees have a limited root system and watering is necessary every few days until the trees are well established.

If the root system is allowed to dry out, the setback to growth can be serious and may even kill the tree. Poor growth can often be traced to faulty irrigation.

Trees in sandy soil need more frequent waterings than trees in heavy soils, but in the absence of rain, give each tree some 8 to 10 gal. of water every two or three weeks after planting. More frequent watering may be necessary in hot, dry weather.

Rule of thumb watering, however, is scarcely good enough. Keep a probe or auger handy and check the soil moisture near the roots of the young trees every week.

—*R. L. PREST, Senior Adviser in Horticulture.*

Tomato Pests in Southern Queensland.—Insect pests of tomato crops are persistent in their attacks and growers in southern Queensland normally make routine applications of insecticides especially for the control of those attacking the fruit and foliage. This control is based on mixtures containing lead arsenate or DDT.

Lead arsenate will control chewing pests of tomatoes and DDT will also check sucking insects. The addition of sulphur will control species of mites.

These materials can, as required, be used alone. However proprietary mixed dusts containng DDT and sulphur or lead arsenate and sulphur are available. These materials are also compatable in combination sprays.

At all times thorough applications are essential and on the vegetable farms of southern Queensland machines manually operated have proved most effective.

—*A. R. BRIMBLECOMBE, Senior Entomologist.*

Preparing Banana Land.—In south eastern Queensland, the banana planting season is restricted by legislation to the period August to January inclusive. Normally, plantings take place after temperatures have risen appreciably about October. September to December, therefore, is preparation time. The banana is no different from other crops in preferring a well-prepared soil which permits root movement and free uptake of moisture and nutrient.

Early soil preparation, starting well before planting is intended, is best. If practicable, banana land needs and benefits from a couple of ploughings and harrowings. Do it thoroughly. Provide the depth and tilth and *then* hole-out and plant your material—suckers or bits. I know that sometimes the area is steep and cultivation impossible. Then, of course, it means the mattock, and hard work, and perspiration; but it's worth the trouble to get those new plants properly established!

Don't forget your erosion hazard! Look to preventive measures before even considering cultivation. You need a diversion bank or drain above the planting area to divert and carry away dangerous and erosive water from higher up.

When the land is prepared, put in contour drains at suitably spaced intervals across the slope. These drains are another form of insurance against soil losses. They will slow down and collect surface waters and safely lead them to disposal waterways and gullies.

—*D. DOWDLES, Adviser in Horticulture.*

Brucellosis-Tested Swine Herds

(As at 1st September, 1960)

Berkshire

Bernoth, B., Wyreema
Clarke, E. J., Mt. Alford, via Boonah
Cochrane, S., "Stanroy", Felton
Cook, F. R. J., Middle Creek, Pomona
Crawley, R. A., Rockthorpe, Linthorpe
Edwards, C. E., "Spring Valley" Stud, Kingaroy
Farm Home For Boys, Westbrook
Fletcher, A. C., "Myola" Stud, Jimbour
French, A., "Wilson Park", Pittsworth
H. M. State Farm, Numinbah
H. M. State Farm, "Palen" Stud, Palen Creek
Handley, J. L., "Meadow Vale", Lockyer
Handley, G. R. "Lochlyn" Stud, Lockyer
James, I. M. (Mrs.), "Kenmore" Stud, Cambooya
Kath, E. E., "Topcamp", via Toowoomba
Kimber, E. R., Block 11, Mundubbera
Law, D. T., "Rossvill" Stud, Aspley
Lees, J. C., "Bridge View" Stud, Yandina
Ludwig & Sons, A. R., "Beau View" Stud, Beaudesert
O'Brien & Hichey, J., "Kildurham" Stud, Jandowae East
Orange, L. P., "Eula", Flagstone Creek
Pfrunder, P. L., Pozieres
Potter, A. J., Ascot, via Greenmount
"Tayfield" Stud, Taylor
Q.A.H.S. & College, Lawes
Regional Experimental Station, Hermitage
Rosenberger, N., "Nevrose", Wyreema
Rosenblatt, G., Rosevilla, Biloela
Schellback, B. A., "Redvilla" Stud, Kingaroy
Smyth, E. F., "Grandmere" Stud, Manyung, Murgon
Stark, H. L., "Florida" Stud, Kalbar
Thomas & Sons, F., "Rosevale" Stud, Laravale
Traves, G., "Wynwood" Stud, Oakey
Weier, V. F., "La Crescent", Clifton
Wolski, A., "Carramana", Warra
Young (Jnr.), W., Kybong, via Gympie

Large White

Assenbruck, C., Mundubbera
Barron Bros., "Chiltern Hill", Cooyar
Bell & Son, E. J., "Dorne", Chinchilla
Behm, A. M., "Aleun", Wondai
Bishop, C. E., Beerwah
Butcher, Dr. B. J. & Parnwell, A. J., Plunkett, via Tamborine
Clark, L. D., Greens Creek, Gympie
Coller, R. H., "Relloc", Tallegalla, via Rosewood
Duncan, C. P., "Colley", Flagstone Creek
Fowler, S., "Kenstan", Pittsworth
Franke, H. J., "Delvue" Stud, Cawdor
Garawin Stud Farm Pty. Ltd., 657 Sandgate Rd., Clayfield
Gibbons, A. E. H., Mt. Glorious
Gibson, H., "Thistleton" Stud, Maleny
H. M. State Farm, Numinbah
Hall, M., "Milena" Stud, D'Aguilar
Heading, J. A., "Highfields", Murgon
Hickson, K. L., "Warra", Calliope
Horton, C. J., "Mannuem Brae" Stud, Mannuem, Kingaroy
Hutton, G., "Grajea" Stud, Cabarlah
Jensen, S., Rosevale, via Rosewood
Jones, K. B., "Cefn" Stud, Clifton
Kahler, J. & S., "Karajoy", East Nanango
Kanowski, A., "Exton", Pechey
Kennard, R. B., "Collar" Stud, Warwick
Larsen, H. L., "Oakway" Stud, Kingaroy
Law, D. T., "Rossvill" Stud, Aspley
Lees, J. C., "Bridge View", Yandina
Lobegeiger, L. C., "Bremer Valley" Stud, Moorang, via Rosewoo
Mack, A. J., Mundubbera
"Marcliff", Wecker Rd., Mt. Gravatt
Neilsen, L. R., "Sunny Hill," Ascot, via Greenmount
Neilsen, A. R., Ascot, via Greenmount
Palmer, V. P. & Son, "Remlap", Greenmount
Pampling, G., Watch Box Rd., Goomeri
Port Curtis Co-operative Dairy Association Ltd., Stud Piggery, Biloela
Postle, R., "Yaralla" Stud, Pittsworth
Powell, R. S., "Kybong", Gympie
Q.A.H.S. & College, Lawes
Radel, V. V., Coalstoun Lakes
Radel, R. M., Coalstoun Lakes
Regional Experimental Station, Biloela
Robinson, O. R. & O. J., "Linvale", Argoon, Biloela
Rosenblatt, G., Rosevilla, Biloela
Skyring, G. I., "Bellwood" Stud, via Goomeri
Stanton, H. R., "Lanherne" Stud, Tansey, via Goomeri
Stehn, L. W., "Hodgson Vale", via Toowoomba
Stewart, L., Mulgowie, via Laidley
Stumer, K. F., French's Creek, Boonah
Wharton, C. A., "Central Burnett" Stud, Gayndah
Wieland, L. C. & E., Lower Cressbrook, Toogoolawah
Zahnow, W., Rosevale, via Rosewood

Tamworth

Armstrong, H. J., "Alhambra", Crownthorpe, Murgon
Booth, J. D., Swan Creek, Warwick
Campbell, P. V., "Lawnhill" Stud, Lamington
Coller, R. H., "Relloc", Tallegalla, via Rosewood
Fletcher, A. C., "Myola" Stud, Jimbour
Herbst, L., "Hillbanside", Bahr Scrub, Beenleigh
Kanowski, S. E., "Miecho", Pinelands
Potter, N. R., "Actonvale" Stud, Wellcamp
Regional Experimental Station, Kairi
Salvation Army Training Home For Boys, "Canaan" Stud Riverview
Skerman, D. F. L., "Waverley", Kaimkillenbun
Stephen, T., "Withcott" Stud, Helidon
Thomas & Sons, F., "Rosevale" Stud, Laravale
Wieland, L. C. & E., Lower Cressbrook, Toogoolawah

Wessex Saddleback

Ashwell, J., "Green Hill", Felton South
Cooper, G. J., Neumgua
Douglas, W., "Greylight" Stud, Goombungee
Dunlop, J. B., "Kunawyn", Acacia Rd., Kuraby
Kingsford, D., "San Antone", Toowoomba
Kruger & Sons, "Greyhurst" Stud, Goombungee
Lau, D. E., "Homevale", Goombungee
Law, D. T., "Rossvill" Stud, Aspley
Mack, A. J., Mundubbera
Scott, A., Wanstead Stud, Grantham
Smith, C. R., "Belton Park", Nara
"Wattledale" Stud, 432 Beenleigh Rd., Sunnybank

Landrace

Ashwell, J., "Greenhill", Felton South
Behm, A. M., "Aleun", Wondai
Crawford, G. L., "Glenvillan", Manneum
Crothers, B. M., "Booligar", Clifton
Duncan, C. P., "Colley", Flagstone Creek
Fowler, K. P., "Northlea", Coalstoun Lakes
Grayson, D. G., Killarney
Itzstein, R. A., "Hyde Park", Gooroolba
Jensen, A. P., & Grace, V. S., Theodore
Kath, E. E., "Topcamp", via Toowoomba
Kingsford, D., "San Antone", Toowoomba
Law, D. J., Rossville Stud, Aspley
Lush, P. B. I., Westbrook
Neilsen, A. R., Ascot, via Greenmount
Neilsen, L. R., "Sunny Hill", Ascot, via Greenmount
Orange, L. P., "Eula", Flagstone Creek
Semgreen, A. L. & D. T., "Tecona", Kingaroy
Stehn, L. W., "Hodgson Vale", via Toowoomba
Stummer, K. F., French's Creek, Boonah

Large Black

Pointon, E., Goomburra

attern Plans

Check measurements before buying the pattern. ne that requires little, or no, alteration is obviusly a time saver.

If alterations cannot be avoided try to use the me make of pattern as often as possible so that e necessary alterations can be made almost tomatically.

Accurate cutting saves sewing time. Smooth eam edges are easier to sew evenly and straight, nd do not require additional trimming. Use arp scissors and make long cuts.

Fold material with right sides together before lacing pattern, so that marking can be done on e wrong side.

When sewing for children it can save time to ut more than one garment at a time. Be sure e layers of fabric are laid out straight and nooth, with edges pinned to prevent slipping.

No more than six layers of a lightweight fabric an be pinned and cut with ease, speed and ccuracy.

Some time spent in marking is necessary for ccurate assembling of pieces, but where possible se pins, chalk or tracing wheel in preference to itching.

Follow the assembly directions on the instrucon sheet. It is compiled by trained people who ave planned for the garment to be put together ith the least trouble to preserve line and style, d reduce handling.

Time can be saved by planning how much itching can be done at the one time (without terfering with the next steps) before leaving e machine; and then how much trimming, turng and tacking and pressing before returning to e machine.

By placing the iron and board at right angles the machine further time can be saved.

Between handlings place or hang pieces to prevent creasing.

Aim to reduce the number of fittings. Style, accurate pattern measurements and accuracy of cutting and marking will help achieve this.

Progressive pressing will reduce time needed for final pressing.

Save Labour in the Larder

A well-stocked larder is one of the things in which most women take pride and joy and accordingly it is generally kept in order.

The regular "turning-out", which can be a real bug-bear, can be considerably eased and lessened if a few minutes are devoted daily to maintaining order and cleanliness.

One other factor which has contributed greatly to tidier and better organised larder storage is the design of modern storage. When shelves are narrow—only two jars' depth at the most—

things can't be pushed to the back where they are forgotten, can't be seen or found easily, and gather dust.

Here are some other ways of making larder care easier:

Throw out shelf-paper and replace with self-adhesive plastic, or paint with easy-wipe gloss paint (be sure it is thoroughly dry before replacing jars).

If shelves are wide install a set of step shelves, or a half shelf at back, or back and sides.

Always wipe jars, sauce bottles and containers after use before returning to the shelf.

Make an effort to get the last few glass containers so that you can see their contents at a glance.

Replace torn and lost labels immediately. Brush over with clear lacquer so they'll withstand a few washings.

Group ingredients for quick grabbing, keeping sweet and savoury things apart.

When more than one row of jars are placed on a shelf stagger their arrangement—do not place them one in front of the other.

Keeping the New Look

Fortunately for today's busy homemakers the new finishes which add brightness and colour to kitchen, laundry and bathroom equipment, are easy to care for, and so save time and labour.

Nevertheless it is wise to read the cleaning recommendations in the general instruction booklet or tag, and to check on the labels of new cleaners to find out which surfaces they are suitable for and how to use them.

The following methods of cleaning some of the newer finishes and materials are given by Miss Nancy Foskett, Senior Extension Officer, N.S.W. Department of Agriculture:

Always follow the manufacturer's directions for defrosting and cleaning the interior of a refrigerator.

Mop up spilled liquids immediately.

The plastic fittings on the inside of the doo tend sometimes to acquire a smeary look.

To restore the shine, use liquid soapless detergent, undiluted, then rinse and wipe dry with clean cloth.

The outside surface will respond to an occasional sparing application of a good furnitur cream. (Check the label and follow instructions.

The old advice to wipe over the oven with damp cloth while it is warm holds good, as mos ovens are still lined with vitreous enamel.

If the oven has become greasy, use a mil abrasive paste containing a grease solvent.

A caustic preparation is useful if the surfac is more heavily soiled, but be sure to protect you skin.

For more drastic cleaning use a caustic preparation on a special applicator and leave for a fe hours. Be sure to follow instructions.

Stainless steel sinks usually need only be cleane with hot water, soapless detergent, and a sti brush.

A paste cleanser will remove stubborn marks

A sink mat helps to protect the sink.

In order to preserve the finish, polish wit metal polish.

Silicone Polishes

"Silicones" has now become a familiar household word, for it appears in conjunction with s many products from polishes for floors, furnitur and footwear to fashion fabrics.

With regard to silicone polishes, it should b remembered that in domestic polishes they ar used in two ways.

There is the polish which contains very littl or no wax, in which the silicone is the main polishing agent.

This type of polish produces a very durabl gloss, and leaves a thin protective film.

It is usually recommended for furniture whic is intended to have a highly polished finish.

There is also the wax polish in which silicon fluid is a complimentary ingredient, acting as spreading agent and increasing the gloss.

This is suitable for wood surfaces, cork floors nd lino. (except where the latter are in tile form nd stuck to a sub-floor with bitumen adhesive, n which case an emulsion polish is better).

The British Good Housekeeping Institute's eneral comment on the silicone wax polish is don't apply too much, or too often".

are of Fine China

Fine china with its infinite variety of design nd quality, adds much to the enjoyment of living. ome of the finest, most delicate and well-designed hina is a joy to behold irrespective of its purose, while well-proportioned, artistically coloured nd decorated china is part of every perfect meal.

Unlike many beautiful things in our homes, ine china is very durable and will stand a great leal of hard use. But, like anything beautiful, it leserves reasonable care.

Here are some hints for the care of your fine hina:

Individual, separate storage of cups is preferble to stacking.

Narrow, or half-shelves in cupboards make this ossible.

Hanging cups on hooks is sometimes recomnended, but when you are in a hurry there is a isk of breaking the handles or they may be roken if there is not enough clearance below the ups.

It is not a good idea to have too many plates n one stack because of the load placed on those t the bottom.

The most desirable method of storing large latters is to place them in upright "filing" racks.

Cupboard space is then used to best advantage nd there is less likelihood of breaking and hipping.

Before washing fine china it is well to rinse it vith a spray of water, brush it with a soft brush r wipe it with a rubber wiper.

Wash the china soon afterwards.

In general, avoid using a scouring pad or scourng powder on fine china.

Wash the china with a packaged detergent, rinse with clean hot water and drain dry or wipe with a soft linen towel.

Fine china is safe even in a dishwasher, if the dishwasher has rubber or plastic-coated racks and one of the effective but harmless detergents is used.

To avoid scratching the glaze or decoration, plates and saucers should be dropped gently into the rack of the dishwasher rather than slid into place.

Coffee should not be allowed to dry in cups as the stain is hard to remove.

Don't rub aluminium or silver against hard glaze as it may leave metal marks that are hard to remove.

Fine china is heat resistant and may safely be warmed before use, but remember that there is a difference between "warming" and "heating".

China ornaments should be examined frequently as dust mars their appearance.

Wash when necessary, using a soft bristle brush for ornamental parts.

Uses for Baking Soda

When next you put bicarbonate of soda in the peas to keep them green, pause and call to mind that this chemical has special qualities that make it very useful for many household tasks.

Being a mild alkali it emulsifies and dissolves grease and oil.

It dissolves completely, so that it causes no abrasion, or scratching, when used in solution as a cleaner.

Many homemakers will have discovered some other uses for bicarbonate of soda, but for those who don't know them all Miss Nancy Foskett, Senior Extension Officer, Women's Services, New South Wales Department of Agriculture, has listed these:

Wash glassware in a solution of 3 tablespoons of soda to a quart of warm water; rinse in clean water and dry thoroughly.

Cover stains with a paste of soda and water, leave for a while, then wash, rinse, and dry.

Ring stains on glassware will usually disappear if the vessel is filled with a warm water and soda solution and allowed to stand for some time.

Wash food containers and plastic ware in hot, soapy water, then in a solution of soda and warm water (3 tablespoons to 1 quart), which will sweeten as well as clean; rinse and dry.

Food that has hardened on plastic ware may be rubbed off with a paste of soda and water; soda will not scratch the smooth surface of the plastic.

Place a large piece of aluminium foil in a large enamel or china bowl with 3 tablespoons baking soda, and add 3 quarts of boiling water;

Place silver in this solution, allow it to stand there for a few minutes, rinse in clean water, dry thoroughly, and polish with a soft, dry cloth.

Sprinkle a small amount of soda on a damp cloth and rub on any stained area on tea and coffee pots and cups; rinse, then wash in the usua way.

—*New South Wales Department of Agriculture's "Press Notes."*

* * *

Historic Homestead

Mr. C. E. Barnes, M.H.R., and His Wife, in the 120-Year-Old Iron Bark Slab Hut which forms part of their Home at "Canning Downs", in the Warwick District. The well-preserved slab homestead was built by pioneer settler, Patrick Leslie, in 1840. Mr. Barnes, whose racehorse stud is famous throughout Australia, showed his leading sire, "Dalray", to those who comprised the Royal National Association's 1960 Journalists' Tour, sponsored by Shell.

Plate 1

Hybrid Grain Sorghum Varieties were Compared with the Standard Variety Alpha in this Field Trial at the Hermitage Regional Experiment Station. Yields were: Texas 610 (left), 112 bushels an acre; Alpha (centre), 81; and Combine Kafir 60 x Alpha, 119.

Hybrid Sorghum Holds Promise

By R. F. MOORE, Plant Breeder, Agriculture Branch

The first trials of hybrid grain sorghum in Queensland have recently been completed. Results are promising and indicate that a change over to hybrids as occurred with maize may ake place with sorghum. Details of the trials are given in this article.

For many years it has been known that rieties of sorghum, when crossed, exhibit a rge amount of hybrid vigour, particularly in e first generation after crossing. This is a milar situation to that which occurs in maize.

The development of sorghum hybrids was layed by problems of seed production since simple procedure, similar to the removal of e tassel in maize, was possible in sorghum to low of complete cross-fertilization. The rghum head is made up of thousands of flowers ch with its own pollen-sacs. Before complete oss-pollination can take place to give first neration hybrid seed, these pollen sacs must removed or made ineffective. In 1952 a ecial strain of sorghum which produces no llen was bred in Texas, United States of America. This strain is referred to as a "cytoplasmic male-sterile" and has the capacity, when pollinated by pollen from its male-fertile counterpart, to produce offspring which are all male-sterile. When pollinated by pollen from some other strains such as Caprock or Alpha, it produces male-fertile hybrids, some of which are capable of giving increased yields of grain.

American Results

By 1955 cytoplasmic male-sterility had been introduced into a number of varieties—notably Martin, Wheatland and Combine Kafir 60. These were crossed with varieties which restore male-fertility and the hybrids which resulted were grown in field trials. By planting a large number of trials it was possible to determine after two years that about eight hybrids were superior.

As a general rule, the hybrids are **early maturing, slightly taller than their parents and have a capacity to produce high yields.**

Yield increases registered in America vary, but in the State of Texas, where from 3 million to 6 million acres of sorghum are planted each year, official estimates of the increase in yield over standard varieties are from 20 to 40 per cent. Hybrids have been accepted rapidly in America and in many States well over 50 per cent. of grain sorghum planted is hybrid.

Queensland Trials

In May, 1958, the parent lines of some American hybrid sorghums were planted in Queensland under quarantine conditions. During the summer of 1958-59, seed supplies were built up and this seed was planted in seven field trials last summer. The location of these trials and the yields obtained from eight hybrids are given in Table 1. The two standard varieties were planted in each trial for comparison with the hybrids.

The average yield for each hybrid surpassed that of Alpha by 23 to 45 per cent. and that of Early Kalo by 28 to 47 per cent. In only one trial was a hybrid outyielded by a standard variety, and this hybrid (Martin x Caprock) has now been discarded. This aspect of the trials is very pleasing: the hybrids as a group appear consistently superior to the standard varietie Several of the hybrids appear at this stage to b outstanding. These are Texas 610, Texas 63 and Combine Kafir 60 x Alpha.

Plate 2

Parents of Hybrid Grain Sorghums are Produced Under Bags at the Hermitage Regional Experiment Station.

Texas 610 is an early maturing hybrid, bein similar in maturity to Early Kalo in southe Queensland. The large grain is light-red i colour but is somewhat subject to bleaching. is almost as tall as Early Kalo. In the 1959-6 trials, it averaged 41 per cent. more grain tha the standard variety Alpha.

TABLE 1

YIELD DATA (BUSHELS/ACRE)

Strain	Hermitage	Biloela	Mount Tyson		Gatton	Kingaroy	Warwick	Per Cent. Increase over Alph
			Early Planted	Late Planted				
Hybrids—								%
Texas 601	113	46	75	72	83	62	25	26
Texas 610	112	61	78	76	95	73	36	41
Texas 620	133	39	69	64	91	70	27	31
Texas 630	113	51	72	79	92	76	31	36
Texas 660	125	50	71	72	94	68	32	35
Combine Kafir 60 x Alpha ..	119	51	..	74	..	67	30	45
Martin x Alpha ..	103	55	..	66	..	68	30	37
Martin x Caprock ..	113	56	66	60	75	64	29	23
Varieties—								
Alpha	81	37	60	50	82	50	17	..
Early Kalo	74	33	51	57	80	..	16	..

Texas 630 is only slightly behind Texas 610 maturity. It has a very large white grain. It similar in height to Texas 610. It averaged 5 per cent. more grain than Alpha.

Combine Kafir 60 x Alpha has the leading ueensland variety, Alpha, as its male-parent. lthough not grown in America, this hybrid as promising in the five trials in which it was rown here last year. It is early to mid-season maturity, being earlier than Alpha but not so rly as Early Kalo. It is almost as tall as Early alo. Its grain size is larger than that of Alpha ut smaller than that of the other hybrids. This ybrid, which was sown in only five of the seven ials, yielded 45 per cent. more grain than lpha.

eed Production

Last summer four Apprentice Crossing Plots o produce hybrid seed) were grown by farmers ho in the past have grown Certified Sorghum ed. The area of each plot was two acres. he purpose of these Apprentice Plots was to able the farmers to obtain experience in the oduction of seed and to produce seed so that rmers could test these hybrids on their own operties. Seed from these Crossing Plots has been allocated to various farmers and there is at present no further seed available. Next year it is planned to grow about 14 Apprentice Crossing Plots, with a total area of approximately 150 acres. They will be produced under Departmental supervision but will *not be Certified Seed Plots*. Ample seed should be available from these Apprentice Crossing Plots for all interested farmers to try on their properties in the summer of 1961-62.

A Warning

Although hybrid sorghum has proved successful in America, there is no guarantee that it will be suitable for Queensland farmers, although results so far are most encouraging. Testing over a number of years is required to determine this. Next summer about 12 trials will be sown and the results of these trials will be published in this Journal. With the information from these further trials it should be possible to state more definitely what hybrid sorghum can contribute to Queensland grain farming.

If next summer's trial results are as promising as those of last summer, then hybrid sorghum seed could be produced under a *Seed Certification Scheme* in the summer of 1961-62.

Plate 3

This is a Crossing Plot Grown to Produce the Hybrid Sorghum Combine Kafir 60 x Alpha. The grower, Mr. C. Ziebell, of Mount Tyson, is standing between Alpha, the pollen parent (left) and Combine Kafir 60, the male-sterile plant that bears the hybrid seed.

Give Your Pigs Water, And Keep Them Growing

By D. B. HARRIS, Adviser, Pig Branc

To make 1 lb. of pork, a pig must drink 1 gal. or more of water. So, if you expect your pigs to gain 1 lb. or more a day they must have ample water available at all times.

Growing pigs will drink from 1 to 2 gal. and brood sows up to 5 or 6 gal. a day. It has been known for some time that suckers at 6 weeks being fed on creep feed will drink up to 2 gal. a day although they are still being provided with their mother's milk.

Feed costs go up when the consumption of water goes down. Tests show that animals limited by 25 per cent. of the water they would normally consume, cost 25 per cent. more per 100 lb. of gain. This might well mean that pigs short of water to the extent of 25 per cent. could cost as much as £2 a head more at market weight. There goes the profit!

You might ask, "Why don't pigs continually fight over the water when there isn't enough?"

After the small ones have been pushed away from the water supply for a week or two, they take the line of least resistance. They get conditioned and don't desire so much water. Y have known the man who could work for ha a day and never take a drink of water, whi another carried a water bag at all times. Tha conditioning, and that, with pigs, is where t costs occur. When half or more of your pi no longer demand a full quota of water, gai are reduced and feed costs are increased.

Did you ever sell half of your top weight p and in a short while have the smaller half roc away to heavier weights? Could it be that f the first time they are getting enough liquid f maximum gain?

To get your pigs to take a maximum amou of water:

(1) Have water available from three wee of age.

(2) Be sure there is adequate water space.

(3) Never let the drinking equipment run o of water.

(4) Keep water cool and fresh.

(5) Use adequate balanced rations.

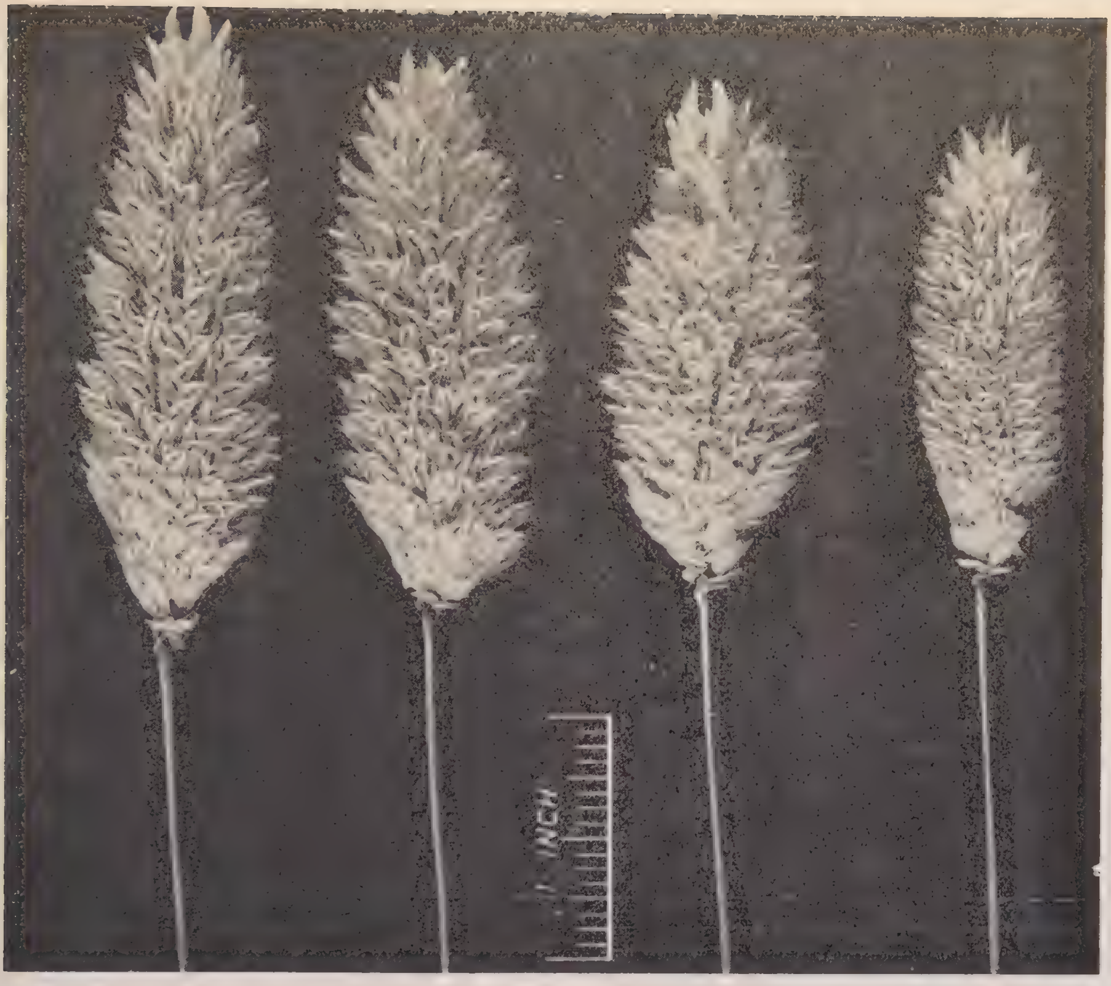


Plate 1

Selected Heads of the Four Strains in the Canary Seed Strain Trial, Darling Downs, 1958. From left: Super Mammoth; Webster; Nunbank; and Standard. These heads though fairly typical perhaps emphasise the strain differences in head size and shape.

Giant Canary Or Not?

y L. E. BRANDS, Adviser, Agriculture Branch.

Only five years ago, canary ranked highly as grain crop on the Downs. It has lost that osition, however, over the last few years, lthough this season shows a revival. This prearious situation is a direct result of fluctuating upplies and demands. The main canary seed roducing countries, Turkey, Morocco and the rgentine, offer a very uniform Mammoth type f grain.

Favourable climatic and soil conditions and perhaps more efficient grading methods, hand harvesting and threshing, probably account for the bigger seed size.

So far, there has been no incentive for the Australian producer to grow "giant" canary. Only once, a premium has been paid for the bigger seeds and at times of low world market supplies, seed size appears to be of no importance at all.

The apparent aim should be to grow the highest yielding varieties when big demands are anticipated.

To compare the yielding ability of different strains of canary, the Department carried out varietal trials in the Bowenville area during the past three years. The results of these trials revealed the following:

Varieties	Average Yields Per Acre in Lb.		
	1957 %	1958 %	1959 %
Super Mammoth ..	633 (88·0)	1,343 (99·4)	979 (85·9)
Nunbank ..	694 (96·5)	1,379 (102·1)	1,094 (96)
Webster ..	717 (99·7)	1,340 (99·3)	1,086 (95·3)
Standard ..	719 (100)	1,351 (100)	1,139 (100)

The 1958 season with good, timely rainfall, shows excellent yields and very slight differentiation between the varieties.

Heavy rains and strong winds towards maturity and delayed harvesting caused the lower yields in the 1959 crop. The difference in production of Standard and Mammoth is quite apparent. The 1957 crop shows poor results due to moisture shortage. Here again Mammoth shows significant lower yielding ability.

Summarised, the position is that the Standard types of canary should be preferred to the Mammoth types, unless, of course, a special demand for the bigger seeds should occur.

With unstable markets, canary will remain a chance crop.

Predicting the Protein Content of Wheat

Before flowering, the growth of the wheat plant has been directed towards the production of leaf and stem. It has drawn on the available plant foods in the soil, the moisture, the carbon dioxide in the air and the sunshine. The nitrogen and sugar compounds, at this stage, are relatively simple and in a soluble form. This is a necessary condition, in order that these compounds can be readily transported to the head. After reproduction has occurred, these soluble compounds are transformed into the insoluble protein and starch.

At the critical period of flowering, the plant should receive no setbacks such as would result from frost, disease and lack of rain.

With the desire to have a knowledge of the protein content in advance for segregation purposes, predictions are very useful. This information would allow the allocation of the necessary storage space. (Growers are accustomed to predicting grain yields, and in the barley industry, predictions are made of the amount of malt extract available from malting barley.)

From experimental work conducted by the Agricultural Chemical Laboratory, it has been found that at flowering time the total weight of nitrogen in the leaves and stalks has almost reached a maximum value. About 40 per cent. of the total amount of nitrogen is retained in this section of the plant while the balance of 60 per cent. is transported to the head, during the period from flowering to full maturity. In terms of the weight of nitrogen, the head at maturity has about four times that which it had at flowering.

On a chemical analysis of the head at flowering, and the grain at maturity, the nitrogen percentage in the head at flowering is found to be about four-fifths of the value of the grain, both being on a moisture-free basis. Translating this result into more practical terms, the percentage of nitrogen (moisture free) at flowering multiplied by six, is equal to the protein content (approximately) of the grain at 13·5 per cent. moisture content.

There are several factors to be observed when using predictions of this nature: The figures used are approximate; the conditions from flowering to maturity must be reasonably normal; head analyses should be made no later than the full flowering period; no fertilizer should have been used, either on the plant or in the soil; the sampling error at flowering is large compared with the grain sample.

—*W. T. KELSO, Senior Cereal Chemist.*

This Dairy Herd Responded To More Feed

By L. A. WILLIS, Adviser in Cattle Husbandry.

During the four years from 1951 to 1955; ie dairy herd of Mr. Harold Beattie, Coomera, veraged an annual production of 107 gal. of ilk and 40 lb. butterfat **per acre.** Based on return of 3s. 6d. lb. commercial butter, this presented a gross return of £8 8s. an acre on is 240-acre farm on the Coomera River flats South-eastern Queensland. For the next four ears, 1955-59, Mr. Beattie succeeded in achievg an average annual production of 150 gal. of ilk and 56 lb. butterfat showing an average oss return of £11 15s. an acre. It's worth membering that both of these four-year periods cluded a drought year.

An average **increased** return of £3 7s. an acre n 240 acres amounts to £804 a year over a ur-year period.

As Mr. Beattie has had a wholemilk quota ver this period ranging from 500-700 gal. a eek, with the remainder of his milk sold at anufactured milk prices, his actual gross turns per acre would be greater than estimated ere. However, for comparative purposes the rice quoted serves to illustrate the improveent in production per acre.

The Beattie family's herd of 65 to 75 A.I.S. ilkers has been production-recorded since 951. Their figures reflect the progress made using production records to assess feeding d farm management.

The production record of Mr. Beattie's herd shown in Table 1, while Table 2 shows proction and estimated returns on an acre basis.

TABLE 1

Recording Year	No. of Cows	Average Production per Cow		Lactation in Days
		Milk in gal.	Butterfat in lb.	
1951–52	65	371	135	243
1952–53	67	456	176	232
1953–54	53	404	145	259
1954–55	60	440	167	258
1955–56	65	511	197	256
1956–57	71	435	163	277
1957–58	65	523	190	277
1958–59	75	614	233	285

TABLE 2

Recording Year	No. of Cows	Production per Acre		Estimated Return Per Acre at 3s. 6d. Lb. C.B.
		Milk in gal.	Butterfat in lb.	£ *s.* *d.*
1951–52	65	100	37	7 14 0
1952–53	67	127	48	10 3 0
1953–54	53	89	32	6 13 0
1954–55	60	110	42	8 15 0
1955–56	65	138	53	11 4 0
1956–57	71	129	48	10 3 0
1957–58	65	142	51	10 13 0
1958–59	75	192	73	15 8 0

How has this increased return been obtained? Better feeding is probably the main factor, with other practices such as careful selection of herd replacements and controlled calving playing a part.

However, better feeding has not meant an increase in quantities of purchased concentrates.

Plate 1

Paspalum and White Clover Give Good Grazing on the River Flats.

Plate 2

Saccaline is grown to Supply Feed when Pastures are lacking in Bulk.

Plate 3

The Windbreak of Pine Trees is both Useful and Decorative.

In fact, the rate of concentrate feeding has not changed from 1951 to 1959. Better feeding in this case has meant better utilization of the feed that has been grown, an improvement in the quality and productivity of the pastures and the use of crops to fill the gap when pasture growth slowed down. In brief, this is what has been done.

The increased quantity of feed available has warranted the use of more cows. This has helped to boost the per acre return in an economical way.

Subdivision of this 240-acre farm into 30 paddocks has played an important role in boosting production. The combined effects of spelling paddocks, ripping, fertilizing and mowing when needed, maintain a good growth of paspalum and clover on the flats near the banks of the Coomera River.

Each autumn the pastures are mown and top-dressed with superphosphate at the rate of one bag to the acre. This helps to provide a good growth of clover during the winter and early spring when grass growth is somewhat slow.

To supplement the pastures, 13 acres of cultivation provide extra feed. Six acres of maize and sweet sorghum with three acres of cowcane and four acres of elephant grass help to maintain the cows' condition and enables them to convert the good quality pasture and concentrates into profitable production.

Plate 4

Cowcane is a Bulky Fodder Especially Useful in Late Winter.

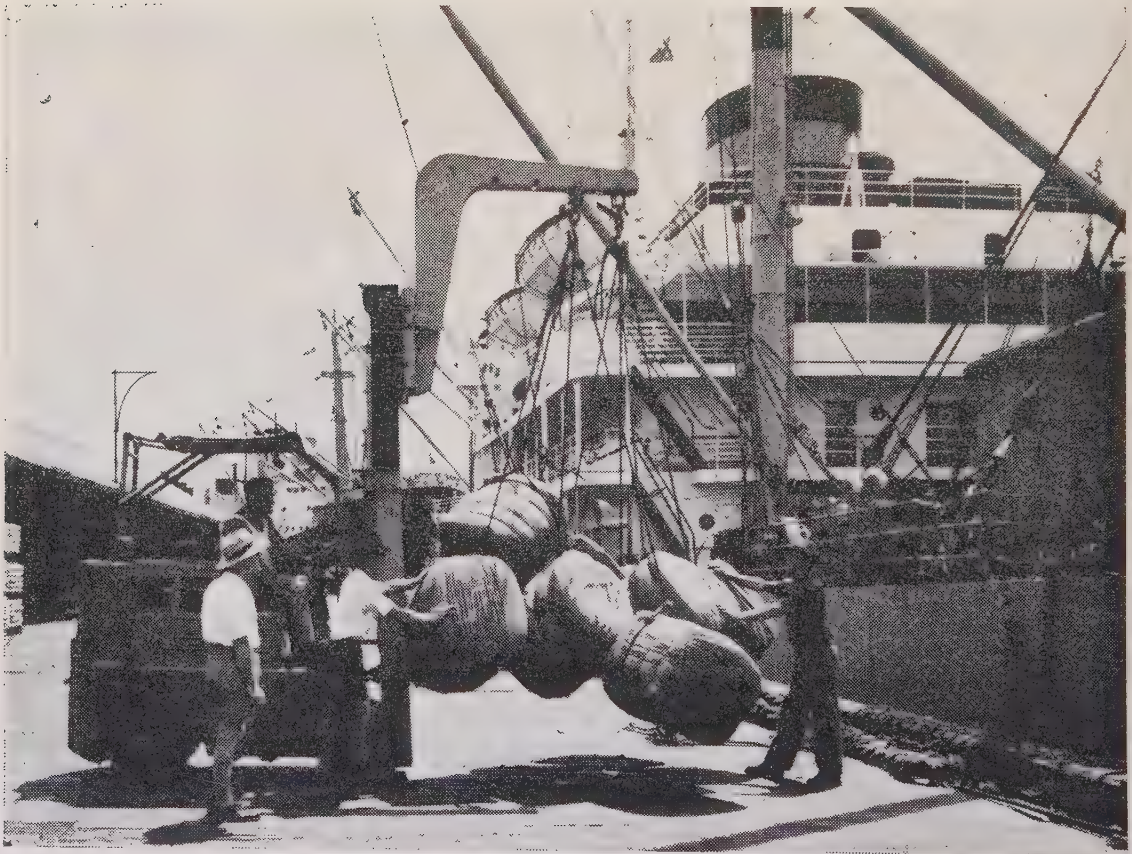
The use of a bull paddock to control matings enables calvings to be arranged at the most profitable time of the year.

Herd replacement heifers are bred on the property. All heifers from top-producing cows are reared and are dehorned with a hot iron. Mr. Beattie realises the importance of maintaining good growth in heifers to get high production from them during their life in the milking herd.

He feeds wholemilk to the calves for the firs month. From one month of age the calves ar fed lucerne chaff and a good quality mea mixture.

Mr. Beattie has realised the importance o applying his production records to his feeding breeding and farm management. His result indicate what can be achieved by making bette use of farm resources.

Wool Goes Overseas



Queensland Wool Consigned to Genoa Being Loaded at Dalgety's Wharf, Brisbane.

bucket and bail

Electric Dairy Water Heaters. From reports from field officers, there appears to be some misunderstanding concerning the operation of electric dairy water heaters and the operation of the "Boiling Switch" frequently incorrectly named "Booster Switch".

Certainly it costs more to heat 14 gal. of water to boiling point (212 deg. F.) than to 180 deg., but in the dairy there is no option. The water for final rinsing must be boiling if it is to do the job intended. The "booster switch" does not switch any more heating elements on, as only one 1,000 watt element is fitted to water heaters. This switch simply disconnects the thermostat so that the power feeds directly into the element, regardless of the water temperature. The water can then be brought to boiling from 180 deg. during the 1 hr. milking time.

Electric dairy water heaters should not be confused with the new electrically heated pressure steam sterilizers recently approved for dairy use. These units provide steam for heating additional quantities of water and for steam sterilizing the machines and utensils.

—*J. D. ELRINGTON, Senior Dairy Adviser.*

Use Colostrum Wisely. For a very special reason, the first milk supplied by a cow after calving differs in composition from normal milk. The milk is reddish yellow in colour and has a strong odour and a bitter taste.

When it is born, the young animal has no reserves of vitamins. Colostrum is designed to compensate for this deficiency and in addition it supplies a large amount of protein fat and antibodies. For instance, the first milk drawn may contain up to 16 per cent. protein in contrast to a normal level of 3·3 per cent., and the mineral content may be 1·1 per cent. in comparison with 0·7 per cent. in later milkings.

With normal rearing the calf should be left with the cow for the first 24 hours, then weaned in isolation, and fed colostrum for at least three to four days.

While colostrum, or beastings, as it is sometimes called, is ideal for the young animal it is unfit for human consumption. It should not be included in the bulk herd milk for at least 10 days.

—*W. D. MITCHELL, Dairy Technologist.*

New Foods From Milk. The Queensland dairy industry is moving away from its traditional dependence on butter, the Minister for Agriculture and Forestry (Hon. O. O. Madsen, M.L.A.) said. Milk powders and continental-type cheeses are providing outlets for milk that would otherwise go into butter.

This is a trend that will give greater stability to dairying, he said. Farm incomes will no longer be influenced so severely by fluctuations on butter export markets.

In the last year, four big dairy associations had decided to install either milk concentrating or spray drying equipment. This will enable them to take milk from suppliers all the year round.

As well as the milk drying plants, a buttermilk drying plant has been established at Monto by the Port Curtis Co-operative Dairy Association. This brings the number of Queensland factories producing buttermilk powder to eight.

At the same time there has been a parallel move in the cheese industry to produce continental-type cheeses for the home market.

Trial production in Brisbane of cultured, unsalted butter has been successful, and this product seems assured of a small but steady market.

Production of hydrochloric casein will commence at the Maleny factory this season. This material will be used for glues in the plywood industry.

Mr. Madsen said the chances of finding export markets for powdered milk depended on a demand for milk protein foods from south-east Asia countries. As the economies of these countries becomes stabilised they can be expected to look to Australia, their nearest neighbour, to supply these necessary milk foods.

But at present the home market offers the best opportunity. The value of milk protein, either skim-milk powder or buttermilk powder, is widely recognised in the stock raising industries. These materials can be used for feeding pigs, poultry and cattle. Demand exceeds the supplies at present available.

Mr. Madsen said the progress being made in finding alternative uses for milk was heartening. In the long term it would put a variety of new milk products on the Queensland market and free the dairy industry of its dependence on unstable overseas butter prices. The combined effect of this would be to make dairy farming a more rewarding occupation.

* * *

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RENEWAL

NEW SUBSCRIBER

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Pass this on to a friend.

Plate 1: Pigs from the South Burnett Arriving in Good Condition at Cannon Hill.

These Pigs Went To Market

By P. D. RANBY, Veterinary Officer.

It is advisable to avoid overfeeding pigs before rucking them to market. On the evening before, ive them only a light feed or no food at all, for igs transported by road on overloaded stomachs an die during the journey.

Plate 1 shows a truckload of pigs which have ust arrived in good condition at the market. Note the slightly hollow flank. This indicates hat they have not been overfed just before the ourney. The pigs left the South Burnett area arly in the morning. The sawdust litter in the ack of the truck is still clean after the four-hour ourney to market.

There is a risk if pigs are trucked on full tomachs. The rapid, jerky movements of the noving truck seem to place a nervous stress on igs. If their stomachs are too full, they are nable to vomit. In addition, the distension of heir stomachs is aggravated when they are umbled about during the journey. Under these onditions, deaths have resulted.

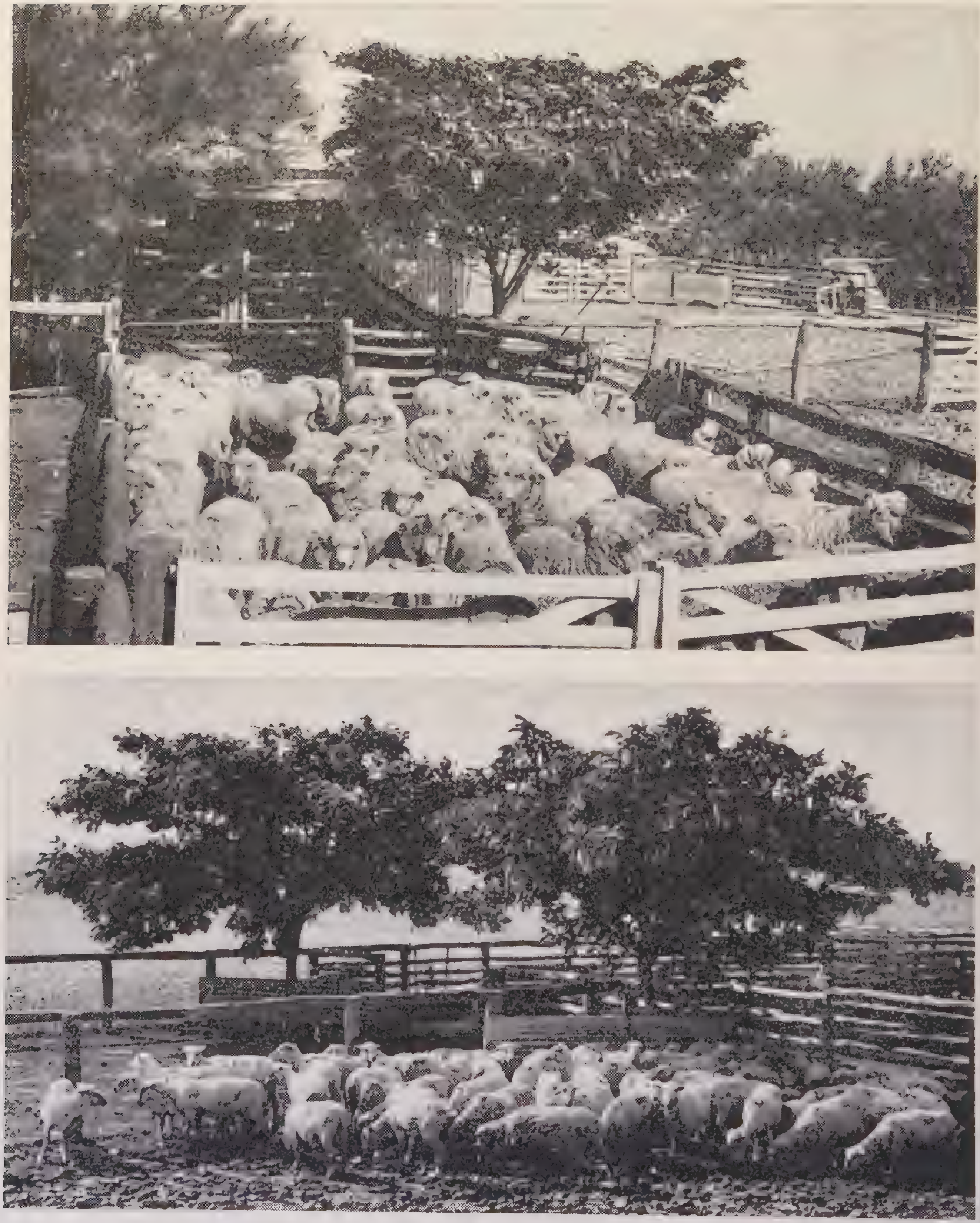
In April, a bacon factory near Brisbane eported deaths in a truckload of pigs from Kingaroy. Eleven of the porker pigs died. The pigs were large whites in good condition and had travelled during the cool of the early morning. Post-mortem examination of a number showed no abnormality except that their stomachs were very distended with sorghum meal.

Stretching of the stomach wall, as in these cases, produces a nervous reflex action on the heart, in addition to pain. Such a reflex action results in heart "flutter" and then failure.

There is no doubt that these pigs were overfed on sorghum meal during the night before they were loaded on the truck; another example of deaths from trucking overfed pigs.

The position with rail transport is rather different from trucking by road. Pigs transported in rail waggons seem much more relaxed; the slower and more gentle movement of these waggons does not seem to cause nervous stress. The moving train keeps the pigs cool but with long stops in hot weather there may be a risk of heat stroke.

Before and After



Top Photo Shows Woollies Going Up for Shearing and at the Bottom, the Shorn Sheep.

Feeding Pullets From Day-Old To Maturity

By F. N. J. MILNE, Senior Poultry Husbandry Officer.

The first four weeks of life is a critical period in feeding chickens, because this is the brief space in which the chick (*a*) is dependent on yolk sac reserve (for the first week), (*b*) can only eat a limited amount of food, and (*c*) grows at a relatively faster rate than at any other time.

It is during, and generally towards the end of, this period that vitamin and mineral deficiencies appear surprisingly quickly and sometimes with disastrous results.

Such rapid growth calls for rapid assimilation of all food constituents, whether they be protein, carbohydrate, fat, vitamins or minerals. Rapid assimilation therefore requires a special type of ration—a chick starter mash which should have the following characteristics:

(1) high protein content (a minimum of 18 per cent.);

(2) low fibre content (4 to 5 per cent. is a good level);

(3) adequate supplies of vitamins A, D3, and riboflavin, and

(4) minerals such as calcium, phosphorus and manganese.

Protein

A high protein mash with a minimum level of 18 per cent. is needed. If vegetable proteins such as peanut meal, soybean meal and cottonseed meal are used, at least 10 lb. of meat and bone meal would have to be added to supply sufficient of the "animal protein factor", the most important constituent of which is vitamin B12. If vegetable proteins were freely available in Australia, then such a ration would still need a riboflavin and vitamin B12 rich supplement such as liver meal to ensure a full supply of vitamins.

Fibre

Chickens cannot digest fibre to any extent. For this reason, mill-offals, barley meal or crushed oats should not be used to the same extent in starter rations as in rations for older birds.

Lucerne meal or fine chaff could be fed at the rate of 2 per cent. to supply the chick's requirements of vitamin K (the anti-haemorrhagic vitamin) but research has shown that lucerne meal or chaff has a growth-depressing effect on chickens, not related to its high fibre content, when fed at levels of 5 per cent. or more.

Vitamin A: Because chickens do not eat a lot of food during the first few weeks of life, it is questionable whether they can get sufficient green feed to supply their wants; also it is not certain how much "carry-over" of vitamin A there has been from the parent birds. It is therefore a wise precaution to *always* include cod-liver oil, fish-oil emulsion or stabilized vitamin A in powder form in chick starter rations. It may increase the cost of feeding slightly, but it is better to be sure than sorry.

Vitamin D3: Vitamin D3 is present in cod liver oil and is added to fish oil emulsions and the stabilized forms of vitamin A. It can also be synthesised by the chick through the action of the ultra-violet rays of sunlight on certain fatty substances in the skin. Vitamin D3 promotes absorption of calcium and phosphorus and helps in their combination and deposition as bone.

Rickets in young chickens is easily detected by the presence of soft, rubbery beaks, "beaded" ribs, ragged-looking feathering and a desire by the chicks to squat down as often as possible. It is caused by a lack of vitamin D3, calcium or phosphorus or too much calcium or prosphorus in the ration. Generally the most frequent cause is brooding chickens in the absence of sunlight without a vitamin D3 rich supplement being added to the mash.

It is essential therefore to supply cod liver oil, fish oil emulsion with vitamins A and D3 or the powder form of stabilized vitamins A and D3 for battery brooded chickens.

This recommendation could be carried further to include *all chickens irrespective of how they are brooded,* because there are many occasions during the early rearing period when a farmer would not expose very young chickens to cold westerly winds or bleak overcast days encountered in outside runs.

It is possible to induce rickets in young chickens when liver meal is the sole source of animal protein. This is due to the fact that liver meal is poor in calcium but very rich in phosphorus leading to an inbalance. The addition of 3 per cent. ground limestone in this type of ration will prevent rickets. However, as liver meal is far more expensive than meat and bone meal, a safe limit would be 5 per cent.

Riboflavin: A deficiency of this vitamin produces "curled toe" paralysis in chickens. Just as riboflavin deficiency, affecting hatchability, will occur in breeding birds fed a laying mash instead of a suitable breeder's mash, so in young chickens this deficiency generally occurs when laying or growing mashes are fed to chickens in place of a good chick starter ration.

As the chickens grow older, their requirements of riboflavin decrease. Liver meal (5 per cent.), buttermilk powder (7 per cent.) and whey powder (7 per cent.) will ensure adequate amounts of riboflavin in the ration. In their place, synthetic riboflavin may be used. In experimental work carried out by the Poultry Section at the Kairi Regional Experiment Station in north Queensland over the past five year synthetic riboflavin has been used exclusively i chick rations because the riboflavin rich foo mentioned are often unobtainable there. How ever, it must be kept in mind that syntheti riboflavin supplies only one vitamin, wherea liver meal, for example, supplies highly valuabl protein and a whole range of B-complex vitamin including riboflavin.

Vitamin B12: The quantity of vitamin B1 inherited from the hen depends (as with, fo example, vitamin A) on the amount present i the breeder's ration. Vitamin B12 is essentia for growth and, provided good quality chic starter mashes with the protein supplied b animal protein are fed, a deficiency should neve be encountered.

Calcium: This is not a real problem in chic feeding, for the demands for calcium are easil met from the meat and bone meal used in th ration. A small amount of finely crushed she grit or ground limestone up to 1 per cent. o the ration can be given.

Phosphorus: The quantity of meat meal o other animal proteins used in chick starter mashe in Queensland to give a minimum protein leve of 18 per cent. will ensure an ample supply o phosphorus.

Manganese: Some cases of perosis or slippe tendon have been diagnosed by the Anim Research Institute, Yeerongpilly. Because the are few, it does not mean that there may n be marginal deficiencies in some of our ration A ration in which bran and pollard are n present or where they are used in limite quantities (under 40 per cent.) has a borderli manganese content. To offset a possibl manganese deficiency, 6 oz. of commercial grad manganese sulphate should be added to every to of mash.

Of the grains, wheat is the best source o manganese, but the manganese content of an grain is insufficient for the birds' needs. Maiz has the lowest manganese content of all grain and the addition of manganese sulphate i necessary where maize meal forms 50 per cen or more of an all-mash chick starter ration.

Weaning Period—4 to 8 weeks

Although the rate of growth is beginning t slow down, no differentiation is made in the typ ration required during the brooder and post ooder stage, so the requirements that apply to e first four weeks of life serve equally in the suing four weeks.

It is well to bear in mind that although the icken's capacity for food is increasing, so are requirements for vitamin A and that it is aching a stage where it may have to face the zards of coccidiosis (both caecal and testinal), fowl pox (if vaccination is not actised) and roundworm infestation. Vitamin does confer some resistance on the growing icken to enable it to withstand these troubles. or that reason, it is a wise precaution to con-ue use of vitamin A supplements for the first ght weeks of life.

eaning to Maturity

During weaning to maturity, growth decreases, hile the amount of food eaten increases. A ash and grain system or an all-mash system of eding may be adopted, but in either case, the otein content of mash or mash and grain ould be 16 per cent. More fibrous feeds may used in greater quantities.

Growing stock after weaning do not require e previous high levels of riboflavin and thus e amounts of such costly riboflavin-rich foods liver meal, buttermilk powder and whey owder may be reduced or deleted from the tion. If an adequate supply of succulent green ed (5 lb. for 100 birds a day) is available, tamin A supplements could be deleted at the scretion of the farmer. It must be stressed ain that a shortage of vitamin A during this riod can undo all the care and attention given young pullets during the brooder and wean-g periods and that the continual use of a tamin A supplement would be a good surance.

As the pullets approach maturity their calcium quirements increase in anticipation of their tural function, which is egg production. Most the calcium is deposited as extra bone in the eleton, to be used from this "bank" when oduction commences. During this stage the owing pullets should have shell grit or non-lomitic limestone grit before them at all times. ould the pullets be housed intensively, proper sorption and utilisation of calcium and osphorus cannot take place unless cod liver oil a fish oil emulsion or other preparation con-ining vitamin D3 is added to the ration.

Adequate Feeding Space

Unless chickens have enough room at the feed hopper, the full beneficial effect of a correct feeding programme and brooder and weaning technique cannot be realised. Too little feeding space results in an unruly, heaving mass of jostling chickens. The bigger ones, by virtue of their size and aggressiveness, are "first in and first served." The smaller chickens, when they do manage to get to the hopper, may only have sufficient time for a few beakfuls of mash which has been picked over by the stronger chickens, before they are chased away by the bullies.

Over a period of time, inadequate feeding space can cause much unevenness in size and development of a growing flock.

The following amounts of feeding space for various age groups of 100 chickens are necessary: day-old to three weeks of age, 10 linear feet; four weeks to six weeks of age, 20 linear feet (or 10 ft. of a double-sided hopper length), and seven weeks onwards, 30 linear feet (or 15 ft. of a double-sided hopper length).

Does and Don'ts

(1) If liver meal, buttermilk powder or whey powder is in short supply, it will be necessary to use vitamin supplements containing riboflavin, pantothenic acid and vitamin K. A number of these in the form of premixes are now available from poultry feed and veterinary distributors.

(2) Restrict the amounts of crushed oats and barley meal to 10 per cent. of the ration.

(3) Linseed meal can be used in small amounts, but because of a toxic factor which may be present it should be used at no more than 5 per cent. of the ration.

(4) White French millet has been found to be a very satisfactory substitute for other grains. It may be fed whole without pre-crushing in the mash. The cheaper it is in relation to other grains, the more you should use.

(5) Don't feed liver meal as the sole source of animal protein. It may induce rickets unless ground limestone is added.

(6) If signs of crazy chick disease (nutritional encephalomalacia) are noted, the addition of 5 lb. to 10 lb. of wheat germ (a potent source of vitamin E) may help to curb the trouble.

stock and station

Homemade Saddler's Clamps. Horses are still much in demand on stations and anything that helps to keep saddlery in good repair and is at the same time economical is valuable to the stockowner. Amongst such gear that it is important to have always handy are saddler's clamps, awl, assorted saddler's needles, twine, and beeswax. With this should be an assortment of buckles, hobbles and chains, rings, and D's, of the miscellaneous kind saved thriftily by the "bower bird" type of stockman who treasures any useful odds and ends.

Saddler's clamps, generally referred to as "clams" by the old type stockman, are mostly of the homemade type. These are made from two well-matched staves from a discarded or fallen-to-pieces barrel, or fat tierce. The clamps are very simply constructed by putting a cup head nut and bolt through the bottom ends of the opposing staves. The clamps are used in the sitting position, straight upright between your knees. Insert the straps or leather to be sewn between the top inverted V of the clamps and get to work with awl, needle, and waxed twine. Sewn harness, girths, surcingles, and so on, are always more reliable than rivetted harness, and if you do your own repairs on convenient wet days or odd times you can feel when you do go to ride that lively colt that if you don't stay on top at least it isn't your gear that has let you down.

—R. B. YOUNG, Senior Adviser,
Sheep and Wool.

Winter Feed Priority to Breeders. The main purpose of feeding a supplement to beef cattle during winter is to prevent irrevocable loss of weight and condition. Cows close to calving or with young calves at foot should have first priority, with weaners and yearlings next in line.

At times, pastoral conditions in many distri are not good, although there is a fair body standing native grass. The quality of this fe is not high enough to ensure that breeders a perhaps weaners will come through the win in reasonable condition. A trend is springi up in the beef industry towards feeding supp ments to at least part of the herd in the wint

Graziers who decide to feed supplements breeders should first draft off empty co because these should still be in good conditio Where cows have calves about six months o supplementary feed will be used most efficien if the calves are weaned and given the ext food. Calves born in spring and summer are, early winter, getting very little milk from th mothers. A small quantity of supplement fed the cows would not increase the milk supply this stage.

It is always difficult to decide just when commence supplementary feeding. There always a chance that the season may break a feeding will not be necessary. On the ot hand, a little feed to breeders in fair conditi is far more effective and economical than a of feed to breeders in very poor condition. The is a good deal in favour of starting to feed befo the cows lose too much condition and vitali Breeders often bring high prices in the ea part of winter and replacement after a dry sp could be expected to be very expensive.

The three months, July, August a September, are the hardest of the year for catt If breeders are losing condition rapidly in Ju losses are likely before the end of wint Graziers in a position to give supplementa feed to selected cattle would do well to surv the position so they may act while there is st time.

—D. N. SUTHERLAND, Director of
Cattle Husbandry.

Milch Goats In Queensland—I

By G. I. ALEXANDER, Senior Cattle Husbandry Officer.

In many countries, goats represent a high pro- rtion of the livestock population. In Australia, ey have not yet attained the popularity reached erseas, this being due largely to the spaciousness our country. Goats are most popular where e little land available must be utilized to its llest capacity. There is a steadily increasing mand for goats in Australia from people living the towns and cities who are not in a position keep a cow. A cow costs about as much to ed as six or eight goats and she grazes over a rrespondingly larger area. Goats have a further lvantage over the cow as they are by nature owsing animals and will readily eat shrubs and ishes (Plates 1 and 2).

In inland Queensland, large numbers of goats e found but they are generally inferior as ilkers. Much can be done to improve the andard of these animals by the continued use only purebred bucks. This is a matter which receiving the attention of some local authorities d much good has been done in grading up own-bred" goats. In inland areas, goat's milk often the only milk available, so an improve- ent in production is a worthwhile step.

REEDS OF MILCH GOATS

The most common breed of goats seen in ueensland is the Saanen (Plates 3-5), but other eeds will be described also so that goat breeders ay compare their different characters.

The Saanen.—The points of a British Saanen are—A long head; facial line straight or dished with a coarse muzzle, with or without a beard; and hornless. Ears erect or pointing slightly forward but never broken or pendant; neck long and slender, with or without tassels. White, pale cream, or very pale biscuit colour is accepted, but white goats are preferred. Coats should be short, with or without a fringe down the back or down the hindquarters.

The following points are allowed but not regarded as necessary for an ideal goat: (1) horns; (2) black spots on the nose, eyelids, ears, and udder; and (3) slightly raised bridge to the nose.

The British Saanen is usually a larger animal with a shorter, sleeker coat and longer legs than the pure Saanen.

The Toggenburg.—The Toggenburg (Plate 6) is fairly popular in the southern States.

The British Toggenburg has the following characteristics: A long lean head, with or without a beard; horned or hornless. Facial line straight and muzzle somewhat coarse. Ears erect or pointing forward, but never broken or pendant. Neck long and slender, with or without tassels. Colour may be from fawn to dark chocolate with white facial lines along face, white legs from the knees and hocks downwards, white on the belly and on or about the tail. The coat should

Plate 1

Goats Browsing in North-western Queensland.

be short, with or without a fringe down the back and down the hindquarters.

The pure Toggenburg is very similar, with the colour being fawn and the markings cream or white.

The Toggenburg is quite a good milker.

The Anglo-Nubian.—The points of a typical Anglo-Nubian (Plate 7) are—Coat short with no fringe or long hair. Colour preferably black and tan, or reddish brown, with or without black or black and white markings but free from white streaks on the side of the face. The horns, if any, should be small and curve down and out. The ears must be long, wide and pendulous but not broken or twisted. The facial line should be plainly arched and the head neat, with a slight taper towards the muzzle, which should be small. The female has no beard.

The Anglo-Nubian yields rich milk, with a high butterfat content. They are quite large animals.

Plate 2

Kids Eating Leaves from a Branch Plucked from a Tree.

GOAT'S MILK

Goat's milk is almost pure white in colour a
is comparatively rich, with a fat content of abo
5 per cent. The fat globules are small and, bei
in a more perfect state of emulsion than in co
milk, do not come to the surface of the milk
standing as readily as those of cow's milk. T
curd forms into very small flakes which, bei
soluble, are readily digestible. The features alli
with the goat's freedom from tuberculosis ma
goat's milk valuable for infants and invalids.
has been used for infantile eczema.

The Angora.—The Angora goat (Plate 8)
noted for its fleece, which is known commercia
as mohair. The average weight of fleece in
herd is about 2½lb., ranging from 10-12 lb. fro
bucks to ½ lb. from kids. Castrated males betwe
two and four years of age produce the best qual
fleece.

Plate 3

A Saanen Doe.

[Photo. by British Goat Society.

The points are: Head fine, with fleece growi
well over the forehead; ears wide, thin and sem
pendant, standing out and then lopping over. T
horns are flat shaped, set far apart on the hea
taper towards the tip, and have a slight tw
which is accentuated in the female. The ch
feature is the quality of the fleece, due to
length, texture, character, and freedom from ha

Composition.—This varies considera
between individual animals. The following ta
gives a comparison between an average sam

f goat's milk with other milks of average uality:

——	Goat	Ewe	Cow	Human
	Per cent.	Per cent.	Per cent.	Per cent.
rotein	4·06	5·37	3·3	1·60
utterfat ..	5·14	3·65	4·0	4·4
ugar	5·28	5·46	5·0	6·9
alts	0·58	0·79	0·60	0·45
otal Solids ..	15·06	15·27	13·18	12·02
ater	84·94	84·73	86·82	87·98

Goat's milk contains more total solids than ow's milk and only slightly less than ewe's ilk.

Yield.—Good goats can give over a gallon a ay and some goats produce far beyond this. The verage goat kept under good conditions should ield about two quarts of milk daily over a period f seven to 10 months. Three pints a day is condered a fair production. A study of the official st records compiled under the British Official ure-Bred Milch Goat Production Recording cheme shows that, over a lactation period of 73 days, the average goat under test gave a otal of about 2,000 lb. of milk and about 80 lb. utterfat. This means a daily average of about x pints of milk. These are purebred goats, and rade animals may not achieve such high producon figures. For the householder a good goat one which will give 800-1,000 lb. (400 quarts) one lactation.

Plate 4

The British Saanen.

[*Photo. by British Goat Society.*

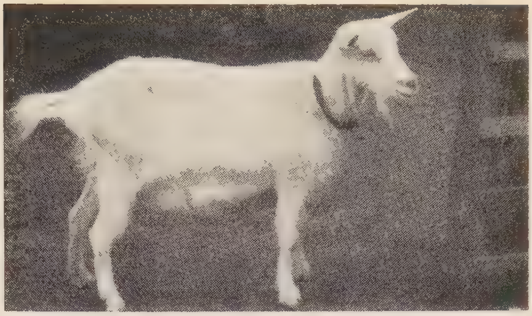


Plate 5

A Saanen Doe.

FEEDING OF MILCH GOATS

Milch goats require good feed and management, as do other types of farm animals. They are selective feeders and require good quality feed for maximum growth and production.

The most economical feed is good quality pasture. A good pasture is a young leafy growth of grass and legume. As pasture matures, its feeding value decreases and when fed alone it provides a ration of low food value. If goats are not fed supplementary food while pastures are deficient they will drop in production, lose condition, and ultimately dry off prematurely. Then even when the pasture does improve, it may be a matter of weeks before the does respond, if at all, to the improved feed. Supplementary feeding is therefore essential to maintain milk production.

Plate 6

A Toggenburg Doe.

[*Photo. by British Goat Society.*

Constituents of Feed

Protein.—The protein content of rations is of supreme importance. Proteins are complex chemical groups containing a number of substances known as amino-acids. The proteins fed in the diet are broken down by the digestive processes and by the action of bacteria in the rumen. In the process they are reduced to their compone amino-acids and these are then converted in other amino-acids and proteins which go to bu up body tissues and muscle and produce mil

Milking goats and growing kids require mo protein in their diet than do bucks and dry sto

THE STANDARD IN AUSTRALIA

The current standard for the milch goat set out in the Goat Herd Book of Australia, is:—

—	Doe	Buck	Perfect Score	
			Doe	Buck
General Appearance— (Attractive individuality revealing vigour, feminity or masculinity with a harmonious blending and correlation of parts) Form, colour of hair and skin	5	5	..	..
Style and Quality— Active and vigorous, showing breed character and vitality. Quality of hair, soft fine and glossy. Skin, loose and pliable	8	10	..	..
Temperament— Alert yet docile	3	5	16	20
Head— Head medium length, fine, feminine in doe and masculine in buck. Forehead broad between eyes. Face—straight preferred—slightly dished—clean. Muzzle—broad strong lips not undershot, wide open nostril. Ears—upright, high on head, fine. Eyes—large, full and bright, amber colour preferred			6	10
Neck— Long, fine, clean at junction with head evenly set into shoulders, no dewlap. Stronger and thicker in the buck. Ewe neck discouraged			3	3
Forequarters— Withers lean and sharp. Shoulders—sloping, blending smoothly into body. Chine straight and strong, well developed vertebrae			10	15
Body— Barrel long. Back straight and strong to hips, wedge shaped, well rounded large and deep abdomen, well sprung ribs. Bones of ribs broad, flat, long, wide apart. Chest fairly deep and full between and back of forelegs. No depression behind shoulder blades. Loins broad level, bones prominent, slightly wider across thurls than hips. Milk veins, prominent. Rudimentary teats on buck well developed			13	15
Hindquarters— Clean and strong, not cow hocked. Pins wide, thighs thin, wide and deep—rump high and broad, level laterally, well carried out			10	15
Legs— Clean, strong and straight, feet apart giving a well poised body, pastern medium and springy			5	5
Udder (Plates 9 and 10)— Well developed according to age, nor pendulous nor unduly divided, carrying up well behind broadly attached with good fore development. Free from fleshiness, soft fine texture			25	..
Teats— Well shaped, well placed (not too close or too far apart) ; well attached to udder—large enough to be grasped easily—2½–3 in. long			5	..
Bucks— Genital organs, well developed, evenly balanced and not divided			..	12
Size and Weight (height taken at withers)— Saanen—Buck, 35 in. and up, 180 lb.			5	5
Doe, 30 in. and up, 135 lb.				
Toggenburg—Buck, 33–36 in., 150–175 lb.				
Does, 26–28 in., 100–135 lb.				
Polled (naturally)			2	..
			100	100

Twenty points should be deducted for horned bucks, and 10 points for neatly disbudded bucks).

Carbohydrates and Fats.—Carbohydrates and ts form the bulk of the food. They are the nergy-producing constituents; they supply nergy for movement and maintenance of body eat, and form body fats. They are also responble for the butterfat and milk sugar (lactose) the milk of the milch goat.

Fats yield about twice as much energy as carboydrates. This accounts for the high energy alue of foodstuffs, such as peanut meal and lineed meal, which contain relatively high proporons of fat. There is a minimum requirement of t in the diet below which milk production will ll even though the energy requirements of the nimal are met.

Fibre.—This is the coarse, less digestible part f the plant, the percentage of which increases as e plant matures. Young green plants are low n fibre, while old mature and dry plants contain high percentage. Fibre has the important funcon of adding bulk to the diet. The normal proesses of digestion in the animal are hindered if ere is insufficient fibre. Some fibre is broken own in the rumen or paunch to supply a small art of the energy requirements of the goat.

Minerals.—Minerals are essential for normal rowth and development. They are needed for e formation of bone, blood and other body ssues. Many minerals are essential to the goat ut only a few are of general importance. These e phosphates, lime, and salt. Many soils, pecially in the coastal areas, are deficient phosphates, and so a deficiency of phoshates may occur in the stock on these eas. Salt and lime deficiencies may occur hand-fed goats and it may be necessary add supplements of salt and finely ground nestone or bonemeal.

High producing goats secrete more inerals in the milk at the peak of their roduction than they are able to absorb om the feed. During the latter part of eir lactation and in the dry period, the epleted mineral resources are replenished. ood feeding must be continued during the y period to make available minerals to eplenish body stores depleted during the evious lactation.

Vitamins.—Goats, being ruminants, are ss likely to suffer form vitamin deficiency an many other animals. Vitamin A is ssential to goats and a deficiency may occur in kids if they are deprived of the colostrum or first milk from their dam. Adults rarely suffer a vitamin A deficiency as they can store enough of the vitamin to tide them over any period of the year when it may be deficient or low in their diet. This is the only vitamin likely to be deficient under Queensland conditions.

Classification of Fodders

Fodders are broadly classified into roughages and concentrates. Roughages are those foods, such as silage, hay, and mature pastures, which contain a relatively low percentage of energy food. There is no sharp dividing line between roughages and concentrates. Important fodders such as mill offals and feeds such as young green crops and pasture occupy intermediate positions between the two. However, when rationing, it is convenient to consider fodders as either roughages or concentrates.

Roughages

Pasture.—Good pasture is the cheapest and best feed for goats. Paspalum is of higher food value than most Australian summer species, but, as it is affected by frosts, is particularly deficient during winter. Winter-growing species such as the rye-grasses, Toowoomba canary grass (*Phalaris tuberosa*), cocksfoot and white clover

Plate 7

An Anglo-Nubian Doe.

[*Photo. by British Goat Society.*

Plate 8

An Angora Buck.

[*Photo. by British Goat Society.*

are suited for winter grazing. Grasses are constantly changing in chemical composition and so in food value. Young leafy grasses have a much higher food value than those with much stem and those which have commenced to flower or seed.

Lucerne hay.—Lucerne hay varies enormously in food value. As the main protein content of the feed is in the leaves, the amount of leaf is a good indication of the protein content. Good green colour also is an indication of high vitamin A content.

Pasture hay.—This varies widely in food value. First-class hay is obtained from young leafy stands containing a high proportion of clovers and in which the grasses have not fully flowered or seeded.

Oaten and wheaten hay.—These are low in protein when cut at the usual haying stage of "early milk" for wheat and "late dough" for oats, but are equal to lucerne hay in energy value.

Concentrates

Maize.—Although goats are capable of grinding maize grain, it is better to feed it crushed. Yellow maize is high in vitamin A and fat.

Sorghum.—Sorghum grain is equal to maize in feeding value. It is rich in carbohydrate and relatively low in fibre. The seed is small and hard and should be fed crushed or cracked.

Oats.—With fewer food units per 100 than wheat, maize, barley, or sorghum, bulk ness is the great advantage of oats a crushed oats help to make the concentra mixture more "open" and attractive to t animal.

Wheat.—Wheat should be fed coarse ground or crushed. It should be fed mixe with other grains as excessive quantiti without other grains may cause bloat scouring.

Peanut meal.—Peanut meal is high in pr tein and fairly high in fat and minerals. It a very useful concentrate. In addition, i palatability makes it a very useful ingredie of a concentrate mixture.

Linseed meal.—Linseed meal is rich fat and high in protein content. It may used up to 25 per cent. of the concentra mixture. It should be fed dry to prevent pruss acid formation.

Cottonseed meal.—This meal is rich in f protein, and food units and is highly palatab It has a similar protein content to peanut mea

Coconut meal.—High in fat, and moderate high in protein, coconut meal is another ve palatable meal.

Meatmeal and blood meal.—These high-prote feeds can be very satisfactory but their lack palatability presents a problem, especially wi some brands of meatmeal. If the goats can induced to eat them, they are a very useful sour of the protein necessary for milk production.

Pollard.—Pollard is about one and a-half tim as rich in protein as grain, but the food unit val is slightly lower. A palatable concentrate, it quite satisfactory in mixtures or alone.

Bran.—Bran has about the same protein co tent as pollard, but is slightly lower in food uni The advantages of bran are its palatability, i beneficial "leavening" effect on the texture of t concentrated mixtures in whcih it is used, and i laxative effect.

Molasses.—This feed is fairly high in food u value, being a concentrated solution of sugar but has no digestible protein. It is of value increasing the palatability of feed and may used to render rather unpalatable mixtures mo acceptable to the animal.

Two Views of a Well-formed Udder.

Plate 9

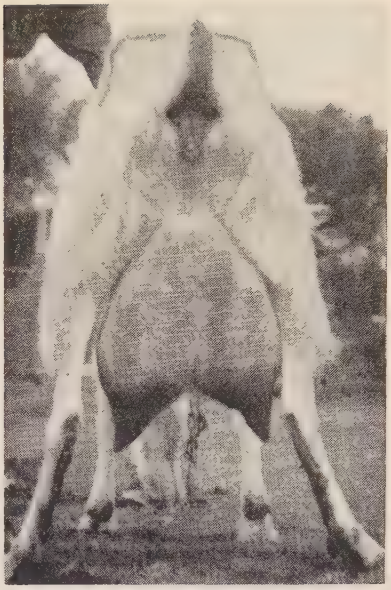


Plate 10

FODDER VALUES OF COMMONLY USED FODDERS

——	Food Units (Starch Equivalent)	Digestible Crude Protein
	Per 100 lb.	Per 100 lb.
ay—		
Lucerne	35	12·0
Cereal	35	2·0
rotein-rich Concentrates—		
Blood Meal	60—70	65—70
Meatmeal	75—80	50—60
Peanut Meal	75—80	40
Cottonseed Meal	65—70	40
Linseed Meal	65—70	30
Coconut Meal	75	16
arbohydrate-rich Concentrates—		
Maize Grain	75	10
Wheat Grain	70	10
Oat Grain	60	10
Sorghum Grain	75	10
Bran	55	12
Pollard	65	14
Molasses	50	. .

oughage Feeding

The first essential in feeding the goat is to ake sure that it gets adequate roughage. This eans that it should have access to all the pasture can eat. If the pasture is insufficient, other oughages should be allowed. Hay may be used; ood quality legume hay is best, but cereals hays re quite suitable if supplemented by the right type of concentrate. If available, silage is an excellent roughage feed. Free access to hay is probably the easiest way of giving the goat adequate roughage.

The usual amount of dry roughage supplied is about 3-6 lb. daily, but an increased weight is required when feeding silage or green crops because of the water content of these feeds.

Concentrate Feeding

When the roughage requirement of the milking goat has been satisfied, the concentrates to be fed must be considered. The type of concentrate to be fed is determined by a number of factors, of which the three important ones are—kind and quality of roughage; milk production of each goat; and cost of the various concentrate feeds.

The type of roughage fed governs the protein content of the concentrate mixture. If the roughage is good quality lucerne hay, lucerne chaff, young crops or young pasture, the concentrate mixture need only have 10-12 per cent. protein. This may be provided by grain alone or grain plus mill offals (bran and pollard). When the roughage is mixed with legume and cereal hay, mature green crops or good pasture, the concentrate mixture must have 14-16 per cent. protein. If the pasture is mature or cereal hay is provided, from 20-24 per cent. protein is required.

A mixture containing 10-12 per cent. protein is—

Crushed grain	1 part
Pollard or bran	3 parts

A mixture containing 14-16 per cent. protein is—

Crushed grain	3 parts
Pollard	1 part
Bran	1 part
Linseed meal	1 part

A mixture containing 20-24 per cent. protein is—

Crushed grain	3 parts
Bran	2 parts
Linseed meal	4 parts
or—	
Meatmeal	2 parts

If full hand-feeding is being carried out, the matter is simplified. Lucerne hay or chaff requires grain alone or grain plus mill offals. Cereal hay or chaff requires the mixture containing 20 per cent. protein.

Alternative rations are—

(*a*) For lucerne hay or chaff—

(i.)	Crushed grains	1 part
	Bran or pollard	3 parts
(ii.)	Crushed grain	4 parts
	Linseed meal	1 part
(iii.)	Crushed grain	9 parts
	Peanut meal	1 part

(*b*) For cereal hay or chaff (oaten or wheaten)—

(i.)	Crushed grain	3 parts
	Linseed meal	2 parts
(ii.)	Crushed grain	3 parts
	Peanut meal	1 part
(iii.)	Crushed grain	3 parts
	Bran	1 part
	Pollard	1 part
	Linseed meal	4 parts
(iv.)	Crushed grain	3 parts
	Meatmeal	1 part

The amount of concentrate to be fed to a milking doe depends on the amount of milk she produces. A pound of concentrate to each 4 lb. of milk produced is a good basis for feeding a milking goat. A close approximation of this is to feed 1 lb. of mixture per day for every three pints of milk produced. A minimum ration of 1 of concentrate per head is desirable.

If good pasture is not available, dry and pre nant does may be fed about 1 to 1½ lb. daily a ration such as —

Crushed grain	1 pa
Crushed oats	1 pa
or—	
Cracked grain	1 pa
Bran or pollard	1 pa

They should be maintained in a thrifty cond tion and not allowed to become too fat or to f away excessively. Pasture or good quality h may make up all the diet of dry animals, wi grain fed just prior to parturition in order to pr pare the doe for the following lactation.

The buck may be maintained in good thrif condition on adequate good quality pasture. there is insufficient, up to a pound daily of a co centrate mixture may be fed. Suitable conce trate mixtures would be:—

Cracked grain	8 pa
Bran	2 pa
Linseed meal	1 pa
or—	
Cracked grain	7 pa
Pollard	3 pa

REARING THE KID

If the full supply of goat's milk is not require the kid may be reared on the goat, allowing t kid the milk in one side of the udder or slight less, depending on the production of the goat.

If the maximum of milk is required, the k should be left on the doe for the first two or thr days only in order to obtain the colostrum. Alte natively, the kid may be removed from the d at kidding and fed the warm colostrum four tim daily for the first two or three days. This may b done with an infant's feeding bottle. The kid m then be reared on ordinary warmed milk by bot and gradually taught to drink from a dish. Th milk should be warmed to body temperature ar fed four times daily for the first three or fo weeks, after which the number of feedings ma be cut down to twice daily.

If maximum growth is desired, the kid shou be fed as much milk as it will consume until abo three months of age. Kids may be reared sati factorily on separated cows' milk after about fortnight. The change-over from whole to skim ilk should be made gradually over about a week. ne amount of milk required by a kid is about pints to 2 pints daily.

Kids should be encouraged to eat grain as rly as possible and some whole grain or a mix- re such as a calf meal should be made avail- ble after the first week to encourage the kid to bble the grain. If the maximum amount of ilk is required for domestic use, the kid may weaned at about eight to 10 weeks provided is fed some grain or meal. After about 3-4 onths of age the feeding of the meal may be dis- ntinued if good pasture is available.

ANAGEMENT OF THE BUCK

The buck requires careful management. He ould not be mated too soon or too frequently. ith adequate feeding a buck can be used at 10 onths without fear of stunting his growth. The ick becomes sexually active at about six to ven months and should be segregated from the males before that age. A separate yard should provided for the buck, and the does in season ould be brought in to him and removed after rvice.

Although the buck will not give very much ouble when running with the herd, this practice evertheless has great disadvantages in contamina- on of milk. The buck contaminates the doe with e odour associated with him at mating time and e milk may be tainted at milking time.

The yard in which the buck is run should be rge enough to allow him plenty of exercise. If pt clean by fairly frequent washing, the buck ill not have any objectionable odour. It is esirable that he be taught to lead and tie up so to be handled easily.

ANAGEMENT OF THE DOE

Goats may breed throughout the year but sually they come in season only during the period ebruary-March to September. During this period ey will come in season every two to three weeks not mated. They usually stay in season for vo to three days.

Goats will mate at six to seven months, but less the young doe is well grown it is pre- erable not to mate it until 12-18 months of age. s the gestation period or duration of pregnancy approximately 150 days, the doe will then be ½-2 years old when her first kids are born.

When a doe comes in season, she becomes very restless and will go off her feed. She will bleat persistently and frequently shake her tail rapidly. Usually the vulva swells considerably and becomes reddened.

Although goats usually come in oestrus for two to three days, the period of oestrus may sometimes be quite short and last only a few hours, so careful attention must be paid to the doe when considering mating her.

The surest sign of pregnancy is absence of oestrus subsequent to service. If a doe is carefully watched for two or three weeks after mating and no sign of oestrus is seen, it may be assumed that she is pregnant.

The condition of the pregnant doe exerts a great influence on the weight of the kids at birth and also on the subsequent lactation. She should be fed well and allowed plenty of exercise.

The signs of approaching parturition are enlargement of the vulva, hollowing of the flanks, restlessness, and continual bleating. The udder usually hardens and springs before kidding.

At parturition there should be as little outside interference as possible. As goats are relatively free from trouble at kidding, assistance is seldom required.

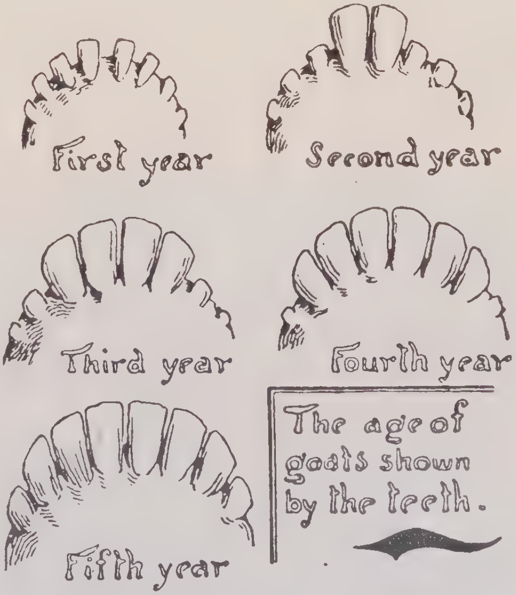


Plate 11

Dentition of the Goat.

[*Diagram by Hook.*

The usual number of kids is two, but frequently there are three, and occasionally four kids.

After kidding, the doe immediately licks the kid dry and usually the kid will then begin to suckle the udder. The afterbirth usually comes away within one or two hours; should it be retained for more than 24 hours, a veterinary surgeon should be consulted.

The doe may be fed a bran mash after kidding. This has a laxative effect and to some extent assists the animal to clean. The bran mash may be prepared as follows: To half a pound of bran and one teaspoonful of salt, add half a pint of boiling water. Cover the mixture with dry bran and then cover with a lid or cloth. The mash should be fed when cool. As mash sours readily, it should always be freshly prepared.

For the first three to five days after kidding, the milk, called colostrum or beastings, is unsuitable for human consumption. However, it is essential for the kids as it contains a high proportion of plasma proteins and vitamins which give the kids some measure of resistance to the diseases associated with young animals.

HERMAPHRODISM

An hermaphrodite is an animal which has the genital organs of both sexes. This defect occurs in goats more than in any other domestic animal. The tendency to hermaphrodism is hereditary and appears to be associated with polled or hornless animals, as horned animals are not affected. There is apparently some heritable linkage between the polled character a hermaphrodism. This is more noticeable the mo closely the animals are bred. If possible, one the parents in breeding goats should have (have had) horns.

MILKING

Milking may be done either from the side from behind, depending on the milker's choic However, it is preferable to milk from the side

Before milking, the udder and teats should thoroughly cleaned with a damp cloth, and it is advantage to give the animal a quick groom prevent hairs from falling into the bucket a causing odours in the milk. When milked ou the udder should be small and elastic with appearance of flabbiness. A big disability wi "town-bred" goats is the small size of the tea This does not occur with Saanen goats. Freque milking tends to increase the yield, but tw milkings in 24 hours spaced as evenly as possib are sufficient for average goats. Regularity a completeness of milking are big factors in kee ing up the milk flow. A long lactation period more important than the amount produced p day, and in purchasing animals this point shou be borne in mind.

Care is necessary in milking, as rough handli may predispose to mastitis.

Machines for milking goats (Plate 14) available and are particularly useful where number are milked daily. Using machines, takes about two minutes to milk each goat. T machines must be carefully cleaned and tend

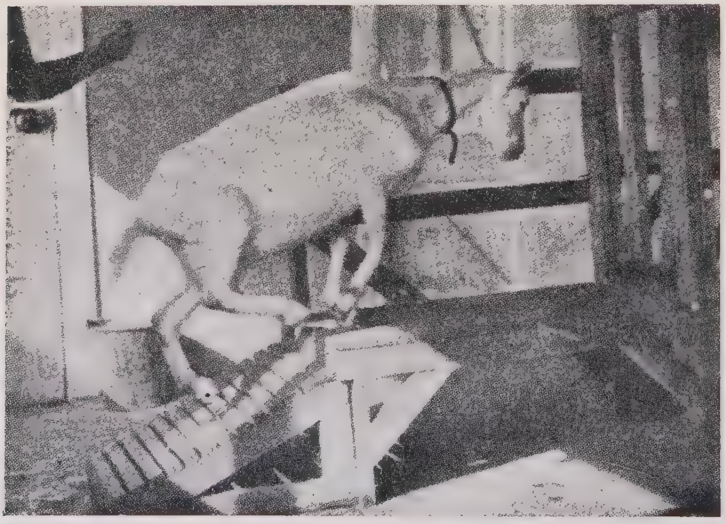


Plate 12

Goat Mounting a Milking Platform to Enter the Bail.

[Photo. by "New Zealand Farmer."

d should be looked after in the same manner milking machines for cows.

EHORNING OR DISBUDDING

There are two common methods of dehorning ds, namely chemical and cautery or hot iron.

hemical Dehorning

Caustic Sticks.—Kids up to 10 days old can treated with caustic soda or caustic potash. austic soda has a tendency to spread and cause jury to surrounding tissues, so caustic potash is referred.

Each "button" or horn bud is clipped to the ze of a one shilling piece and then petroleum jelly smeared outside the horn bud to check the austic from running into the kid's eyes. The austic stick is moistened and rubbed over the orn but with a circular motion until blood just arts to seep through the spot.

The caustic should only be applied to the area f skin covering the horn bud. Too much caustic ay cause excessive burning and scarring of the ead; too little rubbing will leave unsightly scars.

Care should be taken not to get any caustic on lothing or skin, as it is very injurious.

Afterwards the kid should be tied up for at east six hours in a place where it cannot get wet. his is to prevent scratching, rubbing or wetting, hich may spread the caustic.

Antimony Trichloride.—This product has een incorporated in a solution of flexible collodion to form a very satisfactory dehorning gent.

The solution can be made up by a chemist according to the following formula:

	per cent.
Antimony trichloride	28
Salicylic acid	7
Flexible collodion	65

The material is easy to apply and dries readily. There is much less pain associated with this than with caustic sticks and no danger of fluid running into the eyes. The solution is painted on after the area of application has been cleaned with methylated spirits. The animal need not be tied up or kept out of the rain.

Cautery or Hot Iron

The cautery or hot iron method of dehorning is simple, efficient, safe and only slightly painful. A special debudding iron is used for the operation. The iron consists of a solid cylinder of iron or copper five-eighths of an inch in diameter, one end of which is hollowed to form a depression three-eighths of an inch in diameter and half an inch deep. This makes the end of the cylinder a metal ring one-eighth of an inch thick with five-eighths of an inch external diameter and three-eighths of an inch internal diameter. The iron is mounted in a wooden handle for convenient use. The iron may be made smaller if required as it is intended to give a snug fit over the horns to be removed. A soldering iron may be converted fairly readily into an efficient dehorning iron.

The iron is heated to a cherry-red colour and placed over the horn. It is then turned completely around several times until the base of the horn is completely covered by a copper-coloured ring. This indicates that the circulation of blood

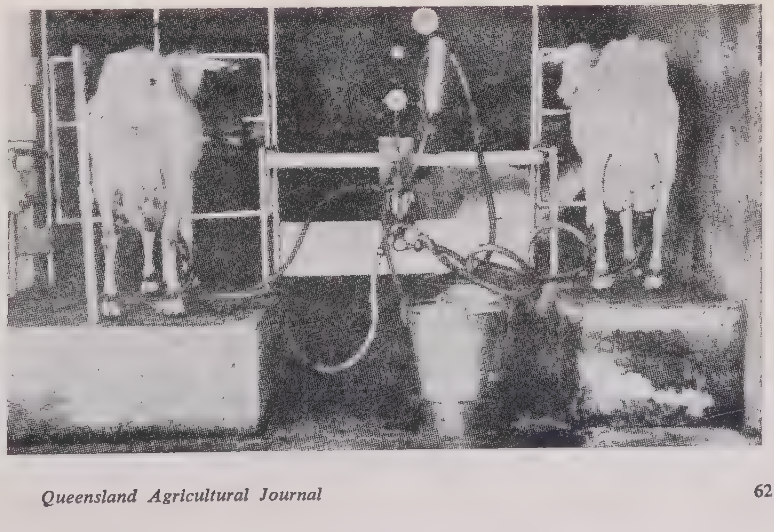


Plate 13

Machine Milking of Goats on Milking Platforms.

[*Photo. by "New Zealand Farmer."*

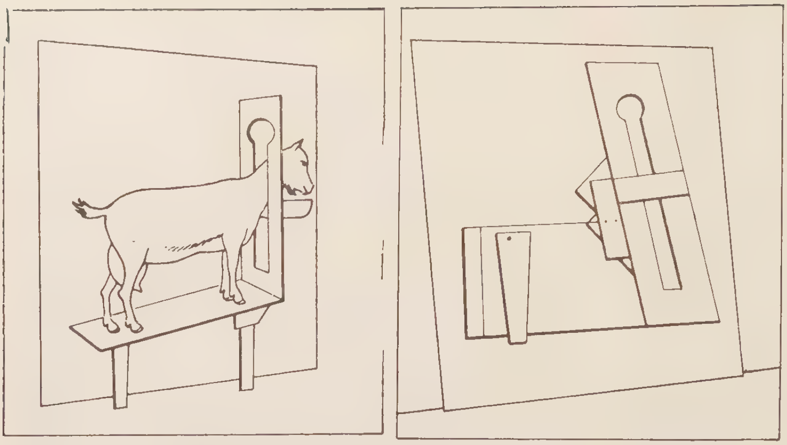


Plate 14

Sketches of a Folding Milking Stand.

[*From "Australian Goat World."*

to the horn has been destroyed. The operation takes 10-30 seconds and the horns drop off by themselves three to six weeks later. There is no haemorrhage, as the vessels are sealed by heat, and the wound produced is dry and clean, heals quickly and completely and cannot burn the dam's udder as caustic may do.

An electric soldering iron with a copper tip containing a hollow cone point similar to that described for the ordinary iron may be used if desired.

Older goats may be dehorned with cup dehorners as used for cattle. This operation is described in a leaflet on dehorning of cattle issued by the Department.

If goats are reared on country where their feet are not worn down as fast as they grow, the feet must be trimmed regularly every four to six weeks. If the feet are not trimmed the horn becomes long and distorted and the goat may become lame.

The wall or thick outside horn of the hoof should be pared level with the sole and the heel should be trimmed to remove any excess growth. The goat's hoof should be supported on a block of wood or box about 10-12 in. high and the wall pared, working from heel to toe.

If the male kids are not to be kept for stud purposes or for meat they should be killed at birth. If intended for meat, they should be castrated at 10 days to three weeks and killed at 3-6 months. At this stage, they are excellent eating, resembling lamb in flavour.

The teeth may be used as a basis for estimatin the age of a goat, as shown in Plate 12.

The goat shed need not be elaborate. Th minimum requirement is a shelter shed of 4 ft. 5 ft. x 5 ft. high with a yard 15 ft. x 8 ft. I addition, the animal should be tethered outsid this area to feed.

Inside the shelter shed should be a milkin stand, which for ease of milking should be abou 18 in. off the ground (Plates 13-15). The benc described and shown in Plate 15 is quite usef and can be kept on one side of the goat she For compactness, it may be hinged to the wa with two legs which are in turn hinged to th bench. When the bench is not in use, the leg may be folded under the bench and the benc folded down against the wall. Alternatively, permanent bench may be erected.

While goats can be readily taught to stan while being milked, especially if being fed at th same time, some type of stall may be used t keep the animal under control. Two types ar shown, one being a hinged type and the othe resembling a keyhole. In the hinged type, th essential feature is that the hole be 3 in. wide 1 ft. long and 20 in. from the level of the bench Both are useful when feeding as they prevent the goat from scattering its food over the floor. The keyhole type is particularly useful when feeding hay from a rack, as it prevents the animal from pulling back from the hay and so scattering i on the floor. Goats are very particular about their food and will seldom eat hay which has been dropped on the floor.

(TO BE CONTINUED)

asture and crop

What About These Summer Crops? The ops in the news at the moment are tobacco, tton, hybrid sorghum and soybeans.

Tobacco is a good crop and there's profit in od quality leaf. It's a bit expensive to get arted and there's a good deal of know-how volved in its successful production. Don't sh into tobacco growing if you've never grown before. Check first with someone who has.

Cotton, while not giving anything like the turns per acre of tobacco, has an unsaturated arket. Cotton needs to be looked after care- lly. You can't plant it and come back at pick- g time. It needs attention throughout the owing period. If you're prepared to give it ose attention cotton could be a useful summer op for you to grow.

If you've been used to growing grain sorghum en there is considerable evidence to show that ybrid sorghum will suit you better than the esent commercial varieties like Alpha and arly Kalo. But there isn't a great deal of seed out as yet. Mr. Ron. Moore, the plant breeder n the job, is pushing ahead and this seed should on be available generally.

Soybeans have been grown commercially for ears in the South Burnett, and Mr. Arthur Kerr, e plant breeder at Kingaroy, has some good azing and grain varieties. We'll certainly hear d see much more of this crop in the future. or the present, check on your market before u grow a large area and if you haven't grown em before, try a small area of a few acres and e what results you get.

For further details about these crops, and hers, too, see your local officer from the epartment of Agriculture and Stock.

—*V. J. WAGNER, Chief Agronomist.*

Pure Seed Scheme for Cotton. A scheme to produce pure seed of seven commercial cotton varieties has been announced by the Minister for Agriculture and Forestry (Hon. O. O. Madsen, M.L.A.). Pure seed will help Queensland farmers to improve the quality of their lint.

He said there was at present a lack of uniformity in much of the lint produced in Queensland, especially in strength and staple length. This may lower the grade and reduce the return to the grower. Improved seed will correct this wide variation.

The pure seed scheme is supervised by the Cotton Marketing Board and the Agriculture Department. Under the scheme, approved farmers will each grow one variety in isolation.

At all stages of growing and harvesting, the crop will be inspected by field officers of the scheme. Strict rules designed to preserve the purity of the seed and freedom from weed seeds and burr have been laid down. The Cotton Marketing Board will pay a bonus of £3 an acre to approved pure seed producers whose crops are grown in accordance with the rules.

Controls in the ginnery will prevent the seed of different varieties from being mixed. Delinted seed will be tested for germination. The minimum germination permitted is 70 per cent.

Commercial varieties that will be grown are: Miller, Empire, Triumph, Lone Star, Arkot, New Mexico Acala, and Rowden. The Department is also building up stocks of at least a dozen new varieties. If tests prove any of these to be satisfactory, pure seed supplies will be increased for general distribution.

First plantings under the pure seed scheme will be made this spring and early summer, and fresh plantings will be made each year. For commercial crops, pure seed will be available from the 1961 planting season onwards.

A committee consisting of officers of the Department and the Cotton Marketing Board has been appointed to administer the scheme. One of the duties of this committee will be to select approved pure seed growers.

Mr. Madsen said setting up the pure seed scheme was a heartening example of self-help within the cotton industry. In the long term it would raise the standard of Queensland lint and increase the security of cotton growing as a farming venture.

Extricating a Bogged Tractor. If ever you bog a tractor, here is an easy way of getting out of the mire. First of all disconnect any implement attached to the tractor.

The equipment you will need will be a fairly substantial piece of wood about 7 ft. or 8 ft. in length, two lengths of chains with some bolts or joiners and, of course, a spade.

There is no need to be fussy about the piece of wood so long as it is strong enough and long enough to come outside the two rear wheels of the tractor. Even a piece of angle iron, pipe or anything available will do just as well providing it will support the weight of the tractor and will take the strain of the chains and wheels as they begin to go forward.

Get busy with the spade and dig in front of the two rear wheels and also under the sump. Now lay the piece of wood, as far down unc the two driving wheels as you can possibly get

With the wood in position fix it to the re wheels by means of the two lengths of cha making quite sure, of course, that the chains not foul the valves.

If the front wheels are on sound ground, w and good, but if they have sunk in, dig a shall slope in front of each wheel.

Now start up the tractor and put it in lo gear—the lowest possible—and this is ve important, be sure to open the throttle only fraction of the way. On no account rev t engine at full throttle. Let in the clutch gen and directly the tractor climbs out of the ho and over the piece of wood stop the tract otherwise the piece of wood will be taken under the rear wings or catch up in the hydrau linkage.

Always remember that labour is expensiv tractors are valuable and time is precious. to avoid getting bogged observe the golden rul directly excessive wheel spin is experienced lifting implements out if tractor mounted, tripping out if of the trailing type. If this h no effect within split seconds, stop and unhit

Another golden rule to remember is to use higher gear and lower engine revs under s ground conditions. To use higher engine re in a low gear is the surest formula for getti bogged on soft ground.

—*C. G. WRAGGE, Agricultural Engineer*

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Atlas of Australian Resources

The latest batch of maps in the series making up the "Atlas of Australian Resources" contains two of special interest to primary producers.

The "Croplands" sheet shows by means of four maps the location of the areas used for the production of wheat and other important crops. The "Geology" map shows Australia's surface geology. A booklet of commentary is supplied with each map.

Other sheets and commentaries just issued deal with Mineral Industry, Manufacturing Industries, and Immigration.

Earlier maps in the series include Physic Features; Climatic Regions; Temperatures; Rai fall; Drainage Systems; Conservation of Surfa Water; Underground Water; Soils; Vegetati Regions; Dominant Land Use; Agricultural Pr duction; Distribution of Stock; and a number others.

The maps have been prepared by the Depar ment of National Development and a distributed by Angus and Robertson Ltd Sydney, to whom enquiries regarding availabili and price should be directed.

TOMATO DISEASES

And How To Control Them—II

By J. C. JOHNSON and J. E. C. ABERDEEN.*

Leaf Shrivel

Leaf shrivel, first recognised in Queensland in 1953, is the most recently detected disease of major importance which affects the tomato crop. Symptoms are not conspicuous, and it is possible that the disorder went unrecognised for many years prior to that time. It is caused by a virus known as potato virus Y.

The most serious effect upon the plant is loss of vigour, which is associated with loss of fruitfulness. Symptoms on the leaves consist of curling and slight mottling with occasional dark grey or brown spotting of the undersides (Plate 15).

The crops most affected are those planted in the autumn which have to set fruit in winter months. Here new infections are indicated by a slowing down in growth, and a slight yellowing of the tops. The new foliage appears somewhat more crinkled than normal, and does not mature to the smooth dark-green pattern of a healthy plant. Instead it remains pale and crinkled, bent slightly more downwards than normal, and becomes harsh and brittle with age. The premature loss of the older leaves gives this trouble the name of leaf shrivel (Plates 16 and 17).

In one controlled experiment where the variety Grosse Lisse (Q2) was tested, diseased plants yielded only 30 per cent. of the crop produced by healthy plants. This experiment was carried out in a glasshouse, without which it would have been impossible to keep the uninfected check plants healthy. In the field, actual yield depression may be much greater, as affected plants are turgid and brittle and the foliage is greatly damaged by wind and rain.

The virus is introduced to tomato plantings by aphids. The rate at which infection occurs is often very rapid, and it is not unusual for a whole planting to be infected by the time that the first fruits have begun to set. A winter seedbed which is not protected from aphids may be totally infected with the virus before the seedlings are removed to the field. Wild gooseberries, apple of Peru, and the black-berried nightshade are weed hosts, and tobacco, capsicum and petunia are susceptible among the cultivated plants other than tomato.

Mosaic is a virus disease of tomatoes which is readily recognised by growers. Leaf shrivel is not so easy to recognise but is probably more widespread. Where both diseases occur simultaneously in a planting there is an almost complete collapse of the crop.

Control

From what is known of leaf shrivel, it would appear that one possible means of control might be the eradication of aphids which transmit the virus. It has been shown, however, that even bi-weekly applications of parathion have failed to prevent the spread of the disease. Such treatments cannot be expected to kill incoming infective aphids before they feed on the plants,

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* Mr. Johnson is a Plant Pathologist with the Department of Agriculture and Stock, and Dr. Aberdeen is Senior Lecturer in Botany at the University of Queensland.

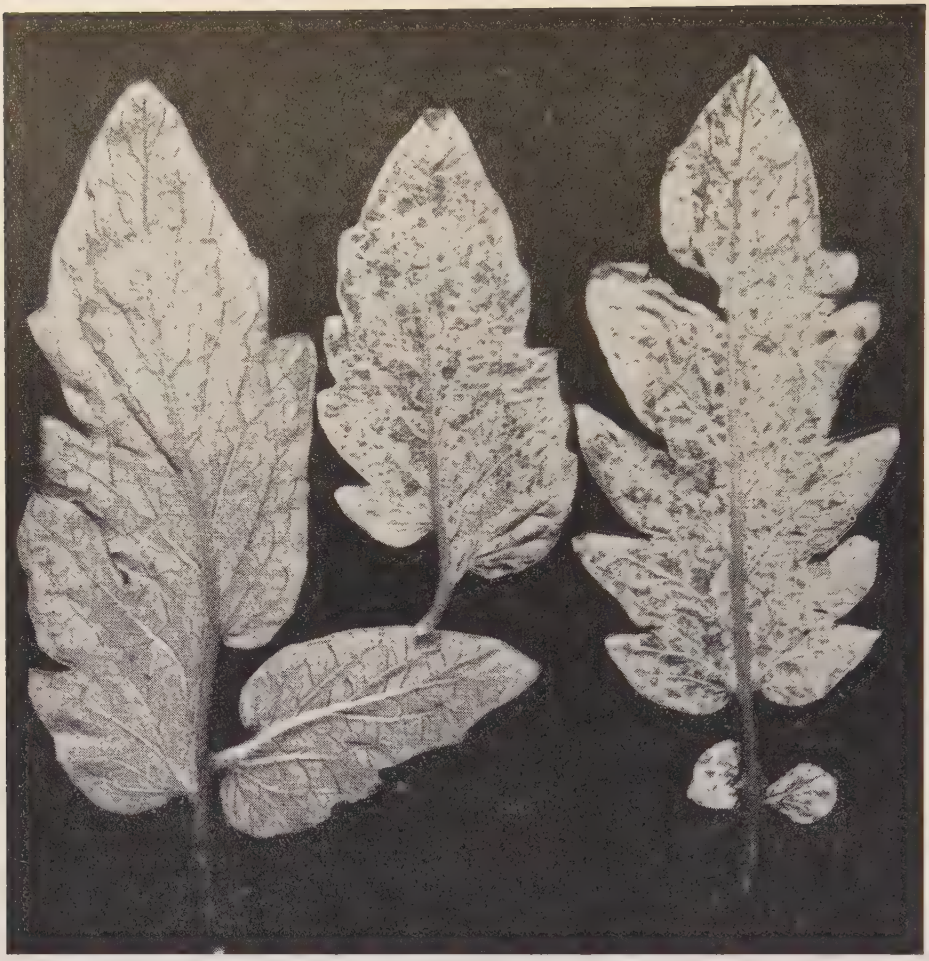

Plate 15

Leaf Shrivel Symptoms on the Under Side of the Leaf (right and centre). Healthy leaf at left.

and it is apparent that secondary spread is not necessary for total infection. Nevertheless the eradication of aphids from winter tomato crops should always be attempted, as this will certainly retard the disease.

Because leaf shrivel does not appear before the end of May, metropolitan growers can set out early enough to permit the plants to make size and set quite a lot of fruit before becoming infected. Crops set out in March are more successful than those set out in April for this reason. Later plantings often fail completely because of the disease. Some excellent late-planted crops have been grown in isolated areas where the virus has failed to appear, but in all the long-established tomato-growing areas, the disease will probably continue to occur with the strict regularity that it has shown since 1953.

Seedlings which are raised in the open at any time during the winter should be protected from aphids. There is no great prospect for spring plantings when the seedlings used are infected with leaf shrivel before they leave the seedbed. The best method of protecting the young plants

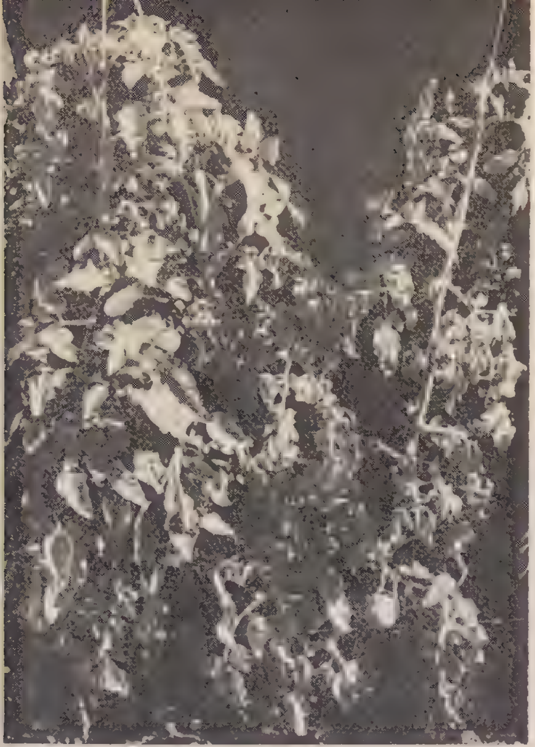

Plate 16

Comparison of Healthy (left) and Leaf Shrivel Infected (right) Plants.

om aphids would be to raise them in a glass-ouse. This facility would seldom be available commercial growers, but a suitable glasshouse ubstitute which would be much less costly would robably serve the same purpose. (See final ction on seedbed management.)

Iosaic

Mosaic of the tomato is identical with the rus disease of the same name which occurs on bacco and may infect a large number of plants the same family—for example, wild goose-erry, wild chili and black-berried nightshade—nd is intertransmissible with these hosts. ffected plants in general are lighter green in olour than is normally the case in healthy matoes, and their foliage is slightly crinkled Plate 18). A close examination of infected ants also shows their leaves to be ottled with indefinite light and dark-green eas. Fruiting on such plants may not be ppreciably affected by the presence of the sease when it is acquired late in the life of

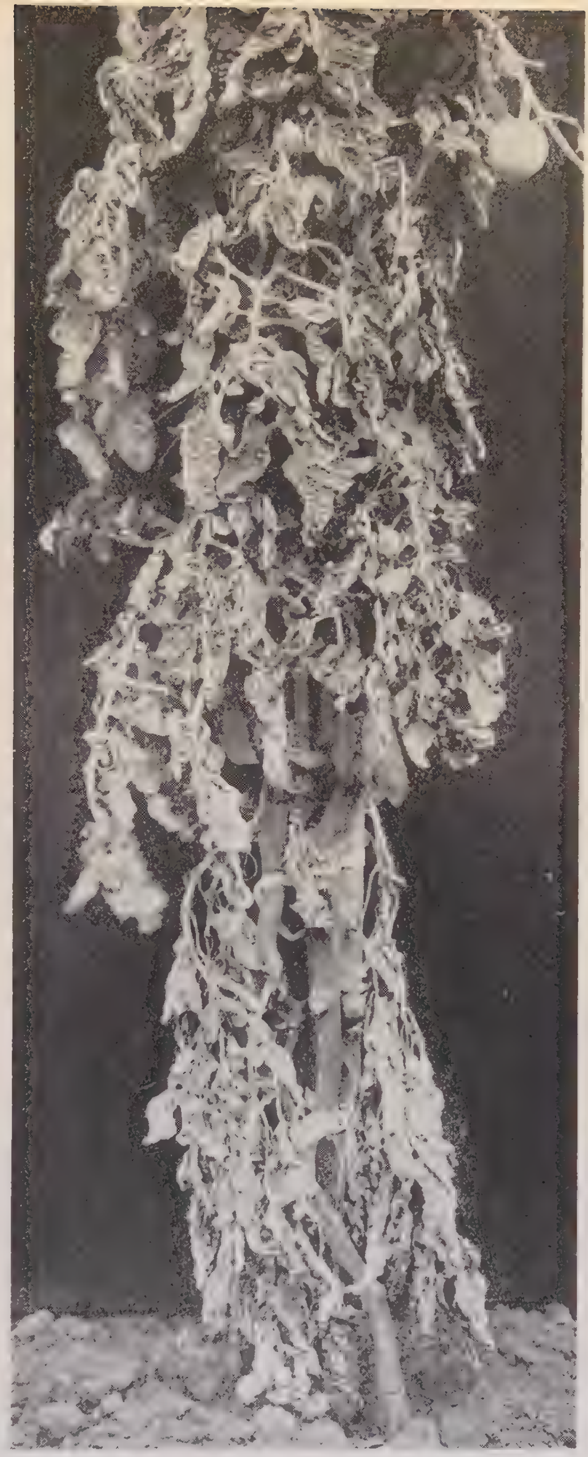

Plate 17

Older Plant Showing Shrivelling of Lower Leaves Due to Leaf Shrivelling Virus.

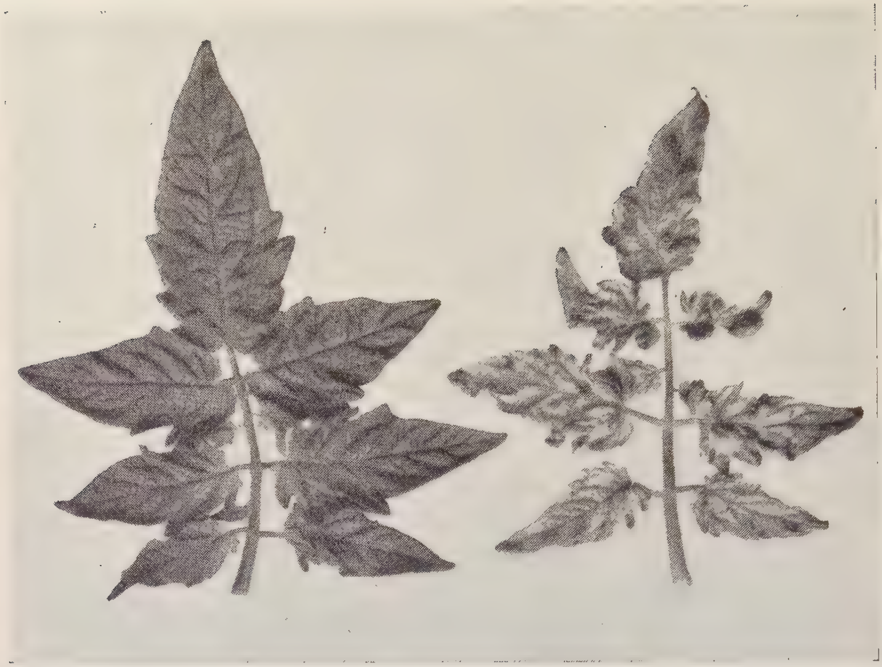

Plate 18

Aucuba Mosaic. The mottling and distortion of the affected leaf on the right is seen in comparison with a healthy leaf on the left.

the plant, but if the plant is infected early the yield loss from mosaic can be very serious.

Fruit which matures on mosaic-infected plants is often blotchy. These blotches are more noticeable after the fruit colours.

Mosaic is extremely infectious and is readily spread by the hands and by pruning knives, and implements used in cultivation. Infection from the hands of tobacco smokers, from seed from an infected crop, from the soil and from old trellis wire have all been reported, but these factors are not so important as the handling of infected plants which accounts for nearly all of the spread.

Fern-Leaf

After a tomato plant has become infected with the virus causing fern-leaf, the first symptoms to appear are thickening and rolling of the leaf edges. At a later stage the terminal shoots become a mass of very narrow, distorted leaflets, all with thickened and curled edges, and if any fruit is borne by such plants it is malformed (Plate 19). The virus causing this disease can infect a very wide range of plants, including many common garden and crop species. In this respect it has much in common with the mosai virus.

Control of Mosaic and Fern-leaf

Frequent inspections of the crop in the fiel are desirable, particularly while the plants a young. Any abnormal plants observed durir these inspections should be removed and burne in order to prevent their acting as a source fro which the virus can be spread to other and, a yet, unaffected plants. If the number of infecte plants is relatively high—say greater than 10 pe cent.—this measure may prove of little benefi

After touching diseased plants, the hands an pruning knives should be washed in soap an running water so as to minimise the possibili of transmitting disease to healthy plants.

Smokers should also thoroughly wash the hands before handling a tomato crop.

The remains of the crop should be cleaned u and burned as soon as it has ceased to be profi able and volunteer tomato and potato plant solanaceous weeds and other host plants whic are likely to carry these diseases into the follow ing crop should be eradicated. The excessiv use of nitrogenous manures appears to increase the severity of the disease.

Big Bud

The disorder big bud is one in which the normal development of the plant is suddenly arrested, and is replaced by the development of very characteristic deformities (Plate 20) which affect particularly the reproductive behaviour—that is, the production of flowers and fruits.

One type of symptom seen is that known as "rosetting". In this case, shoots normally produced in the leaf axil appear as a bunched mass of small narrow leaves. Prior to these rather obvious symptoms there is actually a cessation in growth of the stem, which is often followed by a blueing of the growing tip, and the flower hands instead of curving downwards tend to point upwards. The bizarre forms leading to the name "big bud" are malformed flowers in which the stalks have thickened considerably and the flower itself becomes grossly distorted by an enlargement of the floral parts, while the petals assume a green colour.

Malformed flowers are not always present. Of recent years it has been the practice to ascribe any condition which presents one or more of the important features of this trouble to the same cause. Purpling of the top of the plant, accompanied by cessation of flower production, is a common condition which appears to be a form of the big bud disease.

The disease is due to a virus infection, and while only one insect has been proved to spread the disease there may be others. The incriminated carrier is one of the leafhoppers. It is a small sucking insect approximately $\frac{1}{8}$ in. long, of a grey-brown colour with speckled wings. The presence of leafhoppers generally is readily discerned by disturbing the bushes, which causes them to dart out for a short distance and then either return or lodge in the next bush.

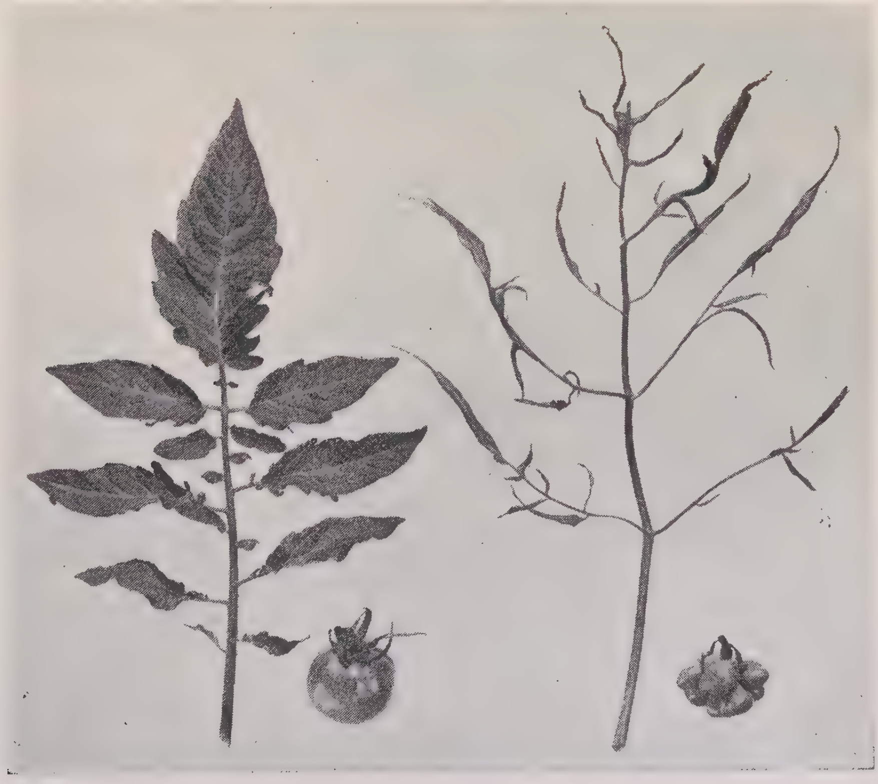

Plate 19

Fern Leaf. Showing affected leaf and fruit in comparison with healthy leaf and fruit.

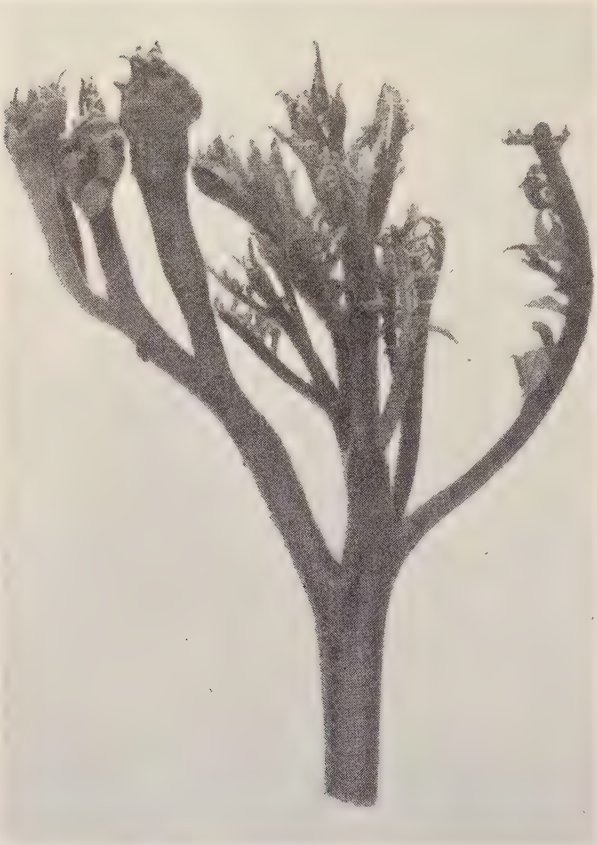

Plate 20

Big Bud. Typical Symptom of the disease.

Usually a grower sees only an occasional plant affected with this trouble but in some districts there is a possibility of an appreciable economic loss. There are two important points to be noted with regard to its entry into the crop, and subsequent spread:

(1) The disease almost always enters the tomato crop from other hosts outside the crop itself.

(2) It is spread by an insect and not by handling, which is in contrast to mosaic.

On hosts other than tomato the big bud symptom is usually absent and the symptom common to most is that of green flowers. A rosetting effect is also fairly common. Well-known plants which have been proved to be hosts are weeds such as dock, nightshade and sow thistle; and garden plants such a antirrhinum, gerbera, petunia, nasturtium chrysanthemum, dahlia, geranium and phlox.

Control

It is apparent that the leafhoppers normall prefer to feed on their weed hosts, and reach the tomato crop either by accident or becaus their weed hosts are being eliminated by drough or some other cause. When the advent of bi populations of infective leafhoppers coincide with a particular circumstance which causes them to abandon their normal feeding grounds, hig rates of infection are recorded on tomatoes.

It is recommended that the grower take goo note of the leafhopper population in the adjacen weed areas. If this is high and there are indica tions that the weed growth may die off, the dusting or spraying of the tomato crop will nee to commence.

For control of the leafhopper within the cro either 0·1 per cent. DDT spray or 2 per cen DDT dust may be used. While the insect i prevalent, treatments will need to be repeate approximately every 10 days.

It should be realised that the plant is actual infected at least three weeks before the appea ance of the noticeable symptoms.

Spotted or Bronze Wilt

Spotted wilt is sometimes known as bronz wilt because of the fact that the young shoot of an infected plant develop a dark reddish brown or bronzed appearance. This is produce by a more or less close aggregation of circula purplish-brown spots each measuring approxi mately $\frac{1}{8}$ in. in diameter (Plate 21). Othe symptoms include the stoppage of active growth the bending back of the leaf stalk, and th incurving of the blades of the leaflets, thus giving a drooping appearance to the plant. Leaves which have developed the bronzed appearance wither and finally dry up. Bronze markings on a blotched yellow and green appearance of the skin may develop occasionally on the fruit of affected plants.

This virus disease, like big bud, is spread by insects and not by handling the plants. The insects in this case are two species of thrips. Coinciding with the rapid increase in thrips opulation in early spring, that period is usually ne main one for the incidence of spotted wilt. t also tends to be more prevalent in backyard ardens than in commercial vegetable areas. his is due to the number of ornamentals that nay carry this same virus—for example, Iceland oppy, nasturtium and dahlia.

This disease cannot be called a major problem n the main tomato-growing areas of Queensland, s the infection is usually less than 1 per cent. here are, however, some areas, such as the airying areas west of Brisbane where tomatoes re frequently grown as a side-line, which have ecorded relatively high infection percentages of p to 40 per cent., and that for a large proportion f the seasons.

ontrol

The measures outlined under mosaic control re sufficient for most districts. Where the isease appears regularly each spring, definite reventive measures will be necessary. DDT ust or spray as used for corn ear worm control nay incidentally give sufficient control of the hrips. Treatment will need to commence in the ery early spring months and carry on into early ummer.

lossom-end Rot

Blossom-end rot is characterised by the ppearance of a light-brown to black, roughly ircular area at the blossom end of young green ruit (Plate 22). The tissue of this discoloured egion is firm and may be shrunken to form a light impression or flattening of the apex. A oft rot may appear in it, but such a development is due to the invasion of secondary rganisms. The early symptoms of the trouble ake the form of small light-brown stains on the pex of the fruit.

This trouble is a physiological one and is not lue to the attack of any plant parasite. It is onsidered that blossom-end rot incidence is ssociated with differences in the rate of water ptake and transpiration by the plant. When he temperature is high and the amount of water apour in the atmosphere is very low, the uantity of water transpired by the foliage of plant may be so high that the uptake of vater by the roots is unable to keep pace with he loss of water from the leaves. This disturbance of the water balance in the plant reacts severely on the fruit and the cells at the apex collapse, causing the typical firm lesion to develop. A dry soil, by limiting the uptake of water by the roots, is conducive to the development of the trouble, but, on the other hand, plants growing in a soil which has dried gradually do not develop blossom-end rot so seriously as those which have experienced a period of heavy rain prior to the hot, dry weather. Infestation of the roots by nematodes, which reduce the efficiency of the roots as water absorbers, aggravates the trouble.

Blossom-end rot is a disease of tomatoes which is usually prevalent during hot, dry periods in summer and spring.

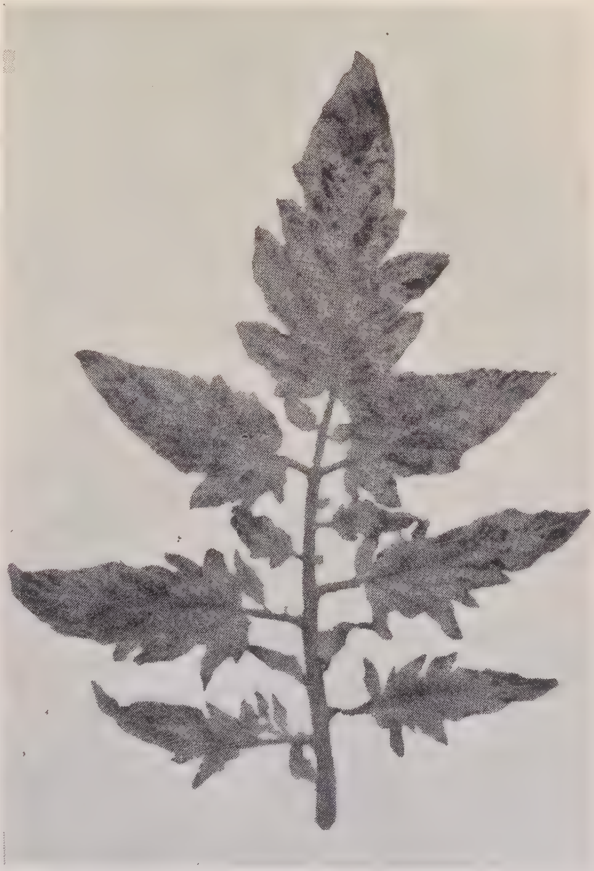

Plate 21

Spotted or Bronze Wilt. Note the close aggregation of spots, causing mottling.

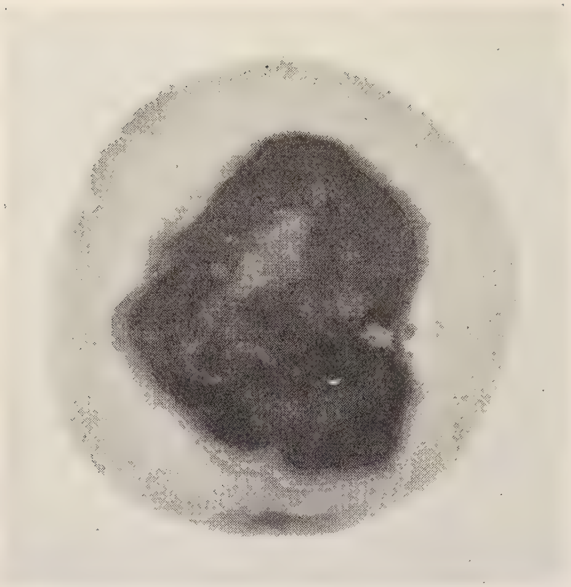

Plate 22

Blossom End Rot.

Control

The control of this disease is, to some extent, beyond the power of the grower. However, he can help by providing an even supply of moisture throughout the growth of the crop by means of appropriate cultural practices and prudent irrigation. Heavy applications of fertilizers rich in nitrogen are undesirable, as these tend to produce abundant foliage, a condition which is conducive to the development of the trouble. When planning a crop it is well to remember that plants grown on the ground are less susceptible to the disease than are staked or trellised crops. If irrigation is not available the grower is strongly recommended to avoid staking or trellising his crop.

Soil conditions have a definite bearing on the incidence of this trouble. In some localities it appears regularly and in others rarely.

Combined Spray for Tomatoes

For general use, apply fortnightly a treatment of a DDT-sulphur-copper oxychloride spray. It should contain 2¼ lb. copper oxychloride to 50 gal. of water and the other constituents as recommended on the label. If weather conditions are such as to require more frequent application of copper for fungus and bacterial diseases, the treatment can be interspersed by a copper plus sulphur spray, as it i unnecessary to use DDT more frequently tha once a fortnight. In recent years the use c zineb as a substitute for the copper componen has considerably increased. This fungicide i slightly superior to copper compounds in controlling target spot, and it is for this reason tha its use has grown. If zineb is substitute intervals between sprays should definitely b shortened to 7 to 10 days.

Cuprous oxide is now available and may als be used as the fungicide component in thes mixtures.

Dusting mixtures containing the same activ ingredients may be substituted for the spray i this method of application is preferred. I general, dusting is not so efficient as sprayin and must be done more regularly. Howeve many experienced growers hold that dusting i preferable from the point of view of overa economy.

Seed Treatment

Should the grower purchase seed and there b any doubt as to its origin it should be disinfecte with corrosive sublimate in the followin manner:

The tomato seed is placed in a piece o mosquito netting and suspended for 5 min. in solution of corrosive sublimate (mercuri chloride) used at a strength of one part of th chemical in 3,000 parts of water. The see mass is stirred occasionally with a wooden stic during the period of suspension in order t remove any air bubbles which may be presen After immersion it is thoroughly washed in fou or five changes of water, dried and then sow immediately.

Corrosive sublimate tablets, with direction for the preparation of the solution, may b obtained from a pharmaceutical chemist.

Seedbed Management

The seedbed should be located as far a possible from likely sources of tomato diseas Obviously it should be well clear of any growin tomato crop which is likely to become neglecte and therefore heavily diseased. A situation nea the house is often undesirable as househol refuse, especially from tomatoes and potatoe can initiate infection, and some ornamental plants carry and act as reservoirs of tomato diseases. Some diseases are carried along in surface run-off water during storms, and for this reason it is desirable to select a high position unlikely to be flooded. Too much shade should also be avoided.

Soil should be fertile, friable and should not have recently grown a crop of tomatoes or potatoes. If any fumigation or sterilization treatment has been carried out, care should be taken not to contaminate the seedbed again with untreated soil or boots, implements, and so on. Animal manure mulches have often been associated with severe bacterial wilt infection, and are not necessary. If mulching is desired, then sawdust, shavings, oak needles or other similar materials are safer.

Soil steaming, either with a steam harrow or by the brushwood fire method is the most satisfactory form of sterilization. Soil sterilization by this and other means is discussed in another pamphlet which is available, on request, from the Department of Agriculture and Stock.

Plants should be raised in rows, and thinned if necessary to permit good air circulation and efficient cover spraying and weeding. Control of leaf spot diseases should be complete and carried out as described under the heading "Target Spot". Insect pests should also be kept strictly under control.

Winter seedlings can be exceptionally well grown with little need for disease control measures if raised in steamed soil in flats under cover of a glasshouse or glasshouse substitute. The same method can be applied to the raising of summer seedlings, but care must be taken to avoid overheating of the glasshouse atmosphere.

Briefly, the method is as follows: A suitable soil mixture is placed in wooden flats (sound cases are satisfactory) and steamed in a 44 gal. drum for 3-4 hours. Extra soil to cover the seeds is also included in the steaming. The flats are stacked up on a platform support to keep them clear of the water layer in the bottom of the drum. This water should be approximately 6 in. deep, to permit the necessary period of slow boiling. A piece of flat asbestos cement sheeting provides a suitable cover, although any material which will permit the steady escape of steam would suffice. The drum is supported over a fire by means of six or eight bricks, and the heating should be steady to provide continuous steaming.

The steamed soil must be protected from recontamination as in the case of externally situated beds which have been sterilized. The boxes can be left in the drum until they can be planted, or, if they have to be removed, placed somewhere where unsterilized soil will not reach them, such as on a bench or in a shed. If a glasshouse is available they could be placed inside immediately. It is usual to allow steamed soil to stand for a week before sowing, although this cannot be regarded as essential. Steamed soil is sometimes hard to wet, and it is advisable to thoroughly water the boxes some hours before sowing. Otherwise an uneven stand of seedlings will result. A high proportion of sand in the mixture will overcome this problem.

Glasshouse structures in our climate need to be provided with more ventilation than do those in the cooler climates. Their chief purpose is to protect the plants from the vicissitudes of the weather, from insect pests, and diseases. Only in winter is the warming effect required. At this time they should be so designed that tight closing-up is possible.

Horticultural glass is the best material to use, although a much cheaper design using clear or white polythene film can be quite successful. Growers desirous of constructing a glasshouse should discuss the project with an officer of the Department of Agriculture and Stock, or someone experienced in this field.

Glasshouse-grown plants should be hardened-off outside for about 10 days before transplanting. During this period they should receive their first combined spray for pest and disease control.

Tuberculosis-Free Cattle Herds

(As at 1st October, 1960)

Aberdeen Angus

Crothers, G. H. & H. J., "Moorenbah", Dirranbandi
Elliott, A. G., "Ooraine", Dirranbandi
Mayne, W. H. C., "Gibraltar", Texas

A.I.S.

Cox, T. L. & L. M. J., Seafield Farm, Wallumbilla
Crookey, J., Arolla A.I.S. Stud, Fairview, Allora
Davis, W. D., "Wamba", Chinchilla
Dennis, L. R., Diamondvale A.I.S. Stud, Mundubbera
Edwards Bros., "Spring Valley" A.I.S. Stud, Kingaroy
Evans, E. G., Lauraven A.I.S. Stud, Maleny
Green, D. B., Deloraine A.I.S. Stud, Fairdale
Heading, C. A., "Wilga Plains", Maleny
Henry, Mrs. K., Greenmount
Henschell, W., "Yarranvale", Yarranlea
H. M. State Farm, Numinbah
Littleton, H. V., "Wongalea", Bowenville
Marquardt, A. C. & C. R., "Cedar Valley", Wondai
McShane, A. H., Handford Road, Zillmere
Mears, G. S. & E., "Morden", M. S. 755 Toogoolawah
Moore, S. R., "Sunnyside", West Wooroolin
Neale, D. G., "Groveley", Greenmount
O'Sullivan, Con., "Navillus", Greenmount
Pinwill, A. A., Gaylands A.I.S. Stud, Gayndah
Power, M. F., "Barfield", Kapaldo
Messrs. Mitchell and Mulcahy, Rosenthal
Queensland Agricultural High School & College, Lawes
Radel, R. R. & Sons, "Happy Valley", Coalstoun Lakes
Roche, C. K., Freestone, Warwick
Sanderson, W. H., "Sunlit Farm," Mulgildie
Schloss, C. J., "Shady Glen", Rocky Ck., Yarraman
Scott, M. E. & E., "Wattlebrae" A.I.S. Stud, Kingaroy
Scott, W. & A. G., "Walena" A.I.S. Stud, Blackbutt
Shelton, R. A. & N. K., "Vuegon" A.I.S. Stud, Hivesville, Murgo
Estate Sokoll, A. H., "Sunny Crest", Wondai
Sperling, G., "Kooravale", Kooralgin, Cooyar
Sullivan Bros., "Valera", Pittsworth
Sullivan, D., "Bantry", Pittsworth
Sullivan, F. B., "Fermanagh", Pittsworth
Thompson, W. H., "Alfavale", Nanango
Webster, A. H., "Millievale", Sabine, via Oakey
Wieland, A. W., "Milhaven", A.I.S. Stud, Milford, via Boonah

Ayrshire

Dudgeon, C. E. R., Marionville Ayrshire Stud, Landsborough
Dunn, T. F., "Alanbank", Gleneagle
Goddard, B., Inverell, Mt. Tyson, via Oakey
Holmes, J. L., "Benbecula", Yarranlea
Mathie, E. & Son, "Ainslie", Maleny
Scott, J. N., "Auchen Eden", Camp Mountain
Zerner, G. F. H., "Pineville", Pie Creek, Box 5, Post Office
Gympie

Friesian

Behrendorff, E. C., Inavale Friesian Stud, M.S. 786, Boonah
Macdonald, S. E. G., "Freshfields", Marburg
Morrison, E. J., Cedar Creek, via Closeburn
Naumann, C. H., "Yarrabine", Yarraman
Paech, P. B., Grasmere, M.S. 544, Clifton
Pender, D. J., Lytton Road, Lindum
Stumer, A. O., Brigalow, Boonah

Guernsey

Doss, W. H., Degilbo, via Biggenden
Fletcher, A. B., "Cossart Vale", Boonah
Holmes, C. D. (owner Holmes L. L.), "Springview", Yarraman
Johnson, G. L., "Old Cannindah", Monto
Miller, G., "Armagh Guernsey Stud", Armagh, M.S. 428,
Grantham
Ruge, A. & Sons, "Woowoonga", via Biggenden
Scott, C., "Coralgrae", Din Din Rd., Nanango
Swendson, A. C., Coolabunia, Box 26, Kingaroy
Wissemann, R. J., "Robnea", Headington Hill, Clifton

Jersey

Beckingham, C., Trout's Rd., Everton Park
Birt, W. C. M., Pine Hill Jersey Stud, Gundiah
Borchert, Mrs. I. L. M., "Willowbank" Jersey Stud, Kingaroy
Burrows, R. N., Box 23, Wondai
Bygrave, P. J. L., The Craigan Farm, Aspley
Carpenter, J. W., Flagstone Ck., Helidon
Conochie, W. S. & Sons, "Brookland", Sherwood Rd., Sherwood
Crawford, R. J., Inverlaw, Kingaroy
Farm Home For Boys, Westbrook
Fowler, P. & Sons, "Northlea", Coalstoun Lakes
Harley, G., "Hopewell", East Nanango
H.M. State Farm, Palen Creek
Hutton, D. R., "Bellgrath", Cunningham, via Warwick
Johnson, H. G., Windsor Jersey Stud, Beaudesert
Lau, J. F., "Rosallen", Goombungee, Toowoomba
Matthews, E. A., "Yarradale", Yarraman
McCarthy, J. S., "Glen Erin", Greenmount, Toowoomba
Meier, L. E., "Ardath Stud", Boonah
Noone, A. M. & L. J., "Winbirra", Mt. Esk Pocket
Porter, F., Conondale
Q.A.H.S. & College, Lawes
Ralph, G. H., "Ryecome", Ravensbourne
Scott, Est. J. A., "Kiaora", Manumbar Rd., Nanango
Semgreen, A. L., "Tecoma", Coolabunia
Seymour, B. T., "Upwell" Jersey Stud, Mulgildie
Smith, J. A. & E. E., "Heatherlea" Jersey Stud, Chinchilla
Tatnell, W. T., Cedar Pocket, via Gympie
Toowoomba Mental Hospital, Willowburn
Verrall, F. W., "Coleburn", Walloon
Weldon Brothers, "Gleneden" Jersey Stud, Upper Yarraman

Poll Hereford

Anderson, J. H. & Sons, "Inverary", Yandilla
Hill, W. W., Mathalla
Hutton, D. R. & M. E., "Bellgrath", Cunningham, via Warwick
Maller, W., "Bore View", Pickanjinnie
Maller, W., "Bore View", Gowrie Junction
McCamley, E. W. G., "Eulogie Park", Dululu
Wilson & McDouall, Calliope Station, Calliope

Poll Shorthorn

Leonard, W. & Sons, Welltown, Goondiwindi
Yamburgan Pastoral Company, Noondoo

Pineapple Research; What's In Store For The Grower

By R. C. CANNON, Senior Horticulturist.

In the past five years considerable progress has been made in research into many phases of pineapple growing in Queensland. The field is by no means exhausted, and there are still problems to be tackled. However, to obtain the right perspective for future planning, it will be profitable to review what has been achieved, and to examine the work still in progress.

Much of the pineapple research is concentrated in southern Queensland, and based on the Maroochy Experiment Station. In many cases, results obtained are applicable to other parts of the State with only slight modification. However, this is not always so, and work has been undertaken in central and north Queensland to adapt methods to local conditions. Similarly, problems peculiar to individual districts have been investigated in the areas concerned.

Land Management

In the older established pineapple growing areas steady decline in productivity over the years is a problem of major importance. Although at present largely confined to the Near North Coast, the same state of affairs could arise in other districts in the course of time. It is basically a question of land management, involving soil conservation, drainage, and crop rotation and green manuring.

Soil Conservation.—On the Near North Coast irreparable damage has already been caused by soil erosion, and it is a matter of attempting to arrest further soil losses. With this in view, contour planting was introduced some 10 years ago and since then efforts have been made to effect improvements and to develop a system best suited for pineapples. Trials have been carried out at the Maroochy Experiment Station, using equipment designed by the Engineering Department of the University of Queensland to measure surface run-off and soil losses.

As a result of this work it has been found that gradients of 2 to 4 per cent., varying with soil type and slope, are required.

An integral feature of any contour layout for pineapples is the provision of interrow drains, with protective contour drains and banks at regular intervals down the slope. The most recent results have shown that, under some circumstances at least, run-off and soil loss can both be reduced by restricting the interrow drains to one every third row instead of every row, as originally provided. Because of variations in topography and local factors, no hard and fast recommendation is possible, and each contour layout has to be treated on its own merits and modified accordingly.

However, the information now available is considered sufficient for all practical requirements and no further work along these lines is contemplated for the present.

The critical part of any contour system is the safe disposal of run-off in the main drains, which are called on to carry large volumes of water

Plate 1

Maroochy Experiment Station, Nambour; the Main Centre for Pineapple Research.

down steep slopes. Grassing, originally recommended, is probably the best method of all for stabilizing these waterways. Its main disadvantage in pineapple plantations is that the grass tends to encroach on cultivated areas. A more recent development is the use of coal tar, which was pioneered on a private farm. Because of its cheapness and simplicity this method was welcomed and quickly adopted as an alternative to grassing.

Drainage.—Poor drainage on many pineapple soils is responsible for variable losses caused by root rot and allied diseases. In many cases the affected areas are limited in extent and irregularly distributed and, up till recently, little had been done to overcome the problem. A few years ago it was tackled at Maroochy Experiment Station and some success has been achieved.

Mole drains and agricultural pipes have both been tried, the pipes having proved in many respects more reliable. No formal trials have been laid down, but exploratory work has demonstrated the practicability of both methods.

Crop Rotation and Green Manuring.—Work was initiated in 1946, and continued through to 1956, to determine the value of green manuring as a means of restoring fertility and maintaining satisfactory yields of pineapples. The combined results of these trials have shown:

(1) That the inclusion of an inter-cycle green manure in the rotation prevents a serious decline in yield with successive crops o pineapples. Total plant and ratoon crop yields after green manure were 10 to 1 tons an acre higher than with continuou pineapples.

(2) That nothing is gained by extending the inter-cycle period beyond about a yea or, to fit in with normal planting seasons 18 months.

(3) That the effects of an annual legume (Poona pea), a perennial legume (pigeon pea), or a grass (sudan grass) are essentially the same.

(4) That the effect of green manure on yield even in the case of a legume, is not related to the nitrogen contributed by it.

These results provide a basis for crop rotation in pineapples, with a fairly wide choice of green manure crops. It is, therefore, largely a matter of using a green manure that is cheap and easy to handle and suits local conditions. The principles should be applicable equally to all parts of the State.

In view of the generally satisfactory outcome of these investigations, and the fact that they extended over a period of 10 years and encountered a range of seasonal conditions, no further work along these lines has been undertaken. There is, perhaps, some scope for testing a range of green manures in different districts to assess their suitability for the local conditions.

Plant Improvement

In 1950 and 1951, a number of selections were made at Maroochy Experiment Station in the hope of isolating superior strains, assuming some do exist. The progeny of these single plant selections, termed clones, have been in process of multiplication since then, and sufficient plants of 14 of them had been produced by 1958 to commence field trials. The 1958 trial was followed by a second series in 1959, which included one or two additional clones. The remainder should be available in sufficient numbers for field trial within a year or two.

With the 1960 summer crop the first set of data has been obtained, and further results will be coming available each year from now onwards. Results to date show up to 25 per cent. variation in fruit size, some clones being superior to mass-selected material, while others are inferior. In addition, the fruit quality varies, the sugar content ranging from 14·5 to 16·8 per cent., and acid from 0·37 to 0·46 per cent. citric acid equivalent. There is also considerable variation in agronomic characters, such as slip and sucker production, which all have to be taken into account in assessing the relative merits of pineapple types for commercial use.

It will take some years before a proper evaluation of these clones is possible. Seasonal conditions may have an appreciable effect, and it is their average performance over a period that will determine their commercial value. The final evaluation of the clones will present some problems because of the variation in fruit quality. For instance, in the 1958 trial, the clone producing the best quality fruit happens to be the lowest yielder. Admittedly, quality is of some importance to the consumer and, presumably, also to the canner. However, the present price structure takes no account of quality, other than size, and from the individual grower's point of view yield is paramount.

Nutrition

Trials completed in 1957 clarified the basic fertilizer requirements of pineapples in relation to soil type, particularly with regard to their potash content. It was found that most soils, being low in potash, required considerably more than that provided by previous schedules. It was also evident that unnecessarily large amounts of nitrogen were being used and that some economy could be effected. The result was the formulation of a new fertilizing schedule based on a 10 : 2 : 20 mixture.

Subsequent investigations have been concerned with the more efficient use of fertilizer as influenced by placement, forms of potash, and foliage sprays. Some progress has been made and tentative recommendations have been put forward that will effect considerable economy in fertilizer and labour. Further work along these lines is necessary and some has already been undertaken.

Placement of Fertilizer.—In 1957 a trial was laid down at Maroochy Experiment Station to investigate, among other things, the efficiency of soil dressings of potash fertilizer. Applications of sulphate of potash direct to the soil before planting proved considerably more efficient than applying it into the base leaves every six months. Plant growth was better and the plant crop yield was slightly higher, even though the amount applied in the base leaves exceeded that of the soil dressing. Complete data for the ratoon crop are not yet available to determine the total amount required for a full cycle. On present indications, however, it seems that the amount required as a soil dressing will be about half that normally used in base leaf applications.

Further trials will be necessary to confirm these results. The relation between the potash status of the soil and the amount to be applied has yet to be investigated over a range of soil types. In addition, the effect of plant density on fertilizer requirements has also to be examined. Work along these lines has already been commenced and will be extended.

The matter of phosphorus fertilizing has still to be investigated along similar lines. In previous trials, using base leaf fertilizing, no response to this element was obtained, but there has been some doubt as to whether these results may have been affected by phosphorus "fixation". In other

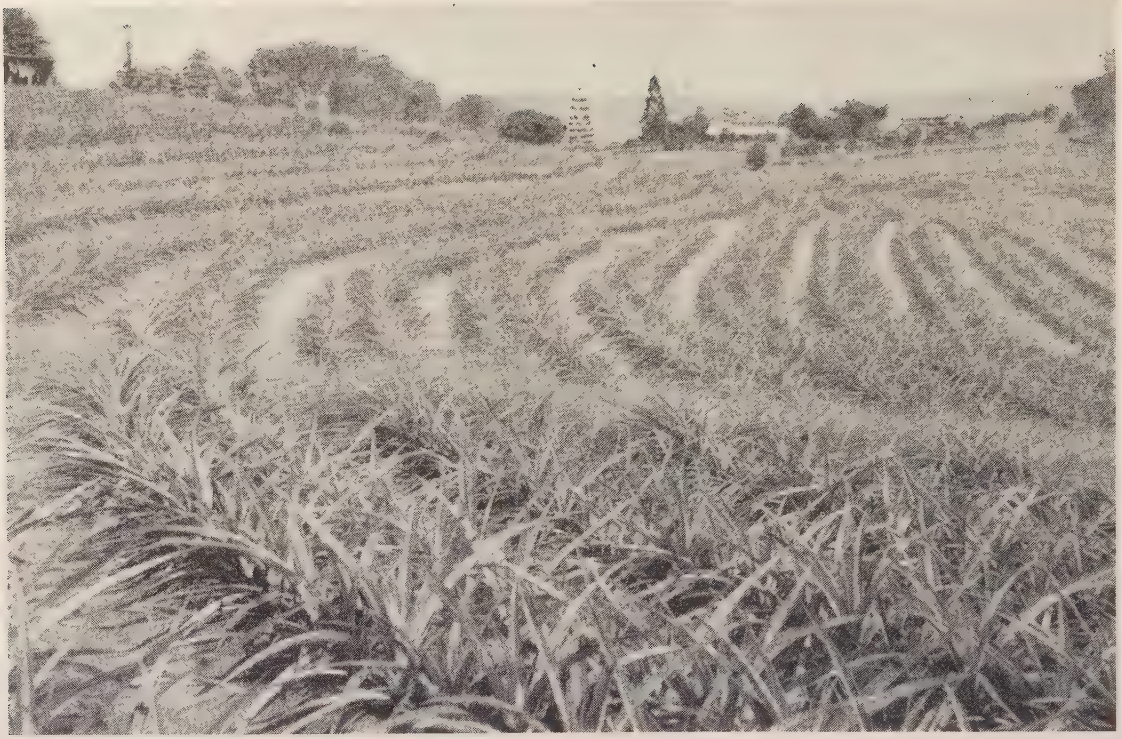

Plate 2

Contour-Planted Pineapples at Woombye. Inter-row drain gradients vary from 2 to 4 per cent., depending on soil type and slope.

crops, responses have been obtained to phosphorus applied in the soil, whereas no such response was obtainable from side-dressings.

Urea Foliage Sprays.—Since 1952, urea foliage sprays have been under investigation because of several advantages, such as their ease of application, and the fact that they do not acidify the soil like sulphate of ammonia. Having previously established the effectiveness of this source of nitrogen for pineapples, trials have since been concerned with rates and frequency of application.

In conjunction with the trial of potash placement, urea sprays were compared with sulphate of ammonia base leaf applications. On the basis of equal units of nitrogen, urea proved equally as effective as sulphate of ammonia, but there was evidence that it must be applied more often than three-monthly for most favourable results. A trial recently established includes a wider range of rates and frequencies, and should supply the requisite information for a satisfactory spraying schedule. The question of urea concentration is also being considered to determine the safe upper limits. It may be possible to apply urea less often if a concentration above 10 per cent could be used.

Forms of Potassium.—From work done in 1936, it has been accepted that sulphate of potash is superior to muriate of potash for pineapples. However, the price differential between these two forms of potassium is appreciable and prompted a re-examination of the question.

Two trials have been undertaken to determine the effects of these two materials on yield and quality, when applied over the whole or part of the cropping cycle. The results reveal some difference in yield, but in view of the generally poor growths of all plants in this trial, it would be unwise to attempt to draw conclusions at this stage. The second trial, which will crop in 1961, may help to clear up the point.

Plant Spacing

Since closer planting than that adopted in Queensland is employed in some other countries with apparent success, a trial was commenced in 1953 with a view to increasing yields by closer spacing. For a number of reasons it was considered preferable to first vary the distance between plants in the rows, leaving the row spacing at 2 ft. between rows and the double rows 6 ft. apart centre to centre. In this trial, reducing the spacing from 12 in. to 9 in. increased the acre yield from 22·3 tons to 29·0 tons, without reducing the size of individual fruits. Almost identical results were obtained in a second trial planted in 1957, which is now in the ratoon stage. In both cases, closer spacing did not affect sucker production or subsequent growth of the ratoon. It is of interest to note that similar work carried out in Taiwan (Formosa) has given almost identical results, according to a published report.

This is an important advance in that it enables growers to increase their yield per acre without a proportionate increase in cost. By planting 19,000 plants to the acre instead of 14,000, an increase of up to 30 per cent. in yield may be obtained, the main extra cost being a corresponding increase in the amount of fertilizer used. It has yet to be determined whether this is directly proportional to the increase in number of plants.

Weedicides

The most drastic change in cultural methods in recent years has been the use of chemical weed control in pineapples. As a pre-emergence spray, PCP has been used consistently over the past 10 years. From time to time other weedicides have become available and have been tested for use in pineapples.

In 1952, the first trials with CMU, now known as monuron, were carried out at Maroochy Experiment Station. These were followed by a series of field trials in most of the pineapple growing districts. At 4 lb. to the acre, this gave better control of grasses and was effective for a longer period than PCP, but its higher cost has so far limited its general use.

Recent trials include diuron (related to monuron) simazine and atrazine, in addition to monuron and PCP for comparison. Results to date indicate that diuron and atrazine have some promise, and may prove superior to monuron and PCP.

Crop Management

Successful crop management depends primarily on effective flower induction and the ability to adjust planting times to have plants sufficiently well advanced at the time of forcing to produce commercial yields. The technique of flower induction is fairly well established, except that there are certain periods of the year when treatment is not reliable. In recent years this question has received more attention with the object of elucidating the factors affecting induction of flowering. The possibility of spreading the harvest by varying planting times is also being investigated.

Flower Induction with Hormones.—Trials have been carried out in central and north Queensland over the past three years in view of doubts which have arisen as to the effectiveness of techniques used in southern Queensland. Trials at Yeppoon have established that ANA and acetylene are both effective when applied in April or May, and that natural flowering is initiated in June. In a trial at Ayr Regional Experiment Station forcing treatments applied during the period from August to December were also effective.

In the Yeppoon trial it was found that April forcing advanced the flowering date by about a month. The earlier flowering did not reach as sharp a peak as later flowering and, therefore, tended to give a greater spread of harvest. The most interesting effect of early treatment was that it promoted earlier suckering and resulted in a shorter interval between plant and ratoon crops. It has still to be established that the same result can be achieved in southern Queensland, and a trial at present in progress is designed to clear up this point. Advancing the summer crop and producing a quick ratoon achieves an important objective, namely, increasing the annual yield per acre by reducing the duration of the cropping cycle.

In the Ayr trial the results indicate:

(1) That a wet season summer crop can be avoided by planting in December to January and forcing in September or October of successive years for both plant and ratoon crops.

Plate 3

Fertilizing Pineapples with a Foliage Spray at Yeppoon. Where the topography permits, boom sprayers of this type may be used to save time and labour in fertilizing.

(2) That the full cropping cycle can be reduced to a period of about 2½ years, as compared with a 3½-year period normally taken in southern Queensland.

Although forcing with hormones or acetylene is effective at most periods of the year, summer is the critical period when results are variable and unpredictable. The weight of evidence both here and overseas suggests that some environmental influences are responsible. The problem has been to determine which factors are involved. Some work has been undertaken over the past two years but has so far not provided the answer.

In 1959, a survey was made in the Maroochy district based on a total of 57 sets of data on such factors as material used, aspect, amount of sunlight, time of day and nutrient status. Apart from an apparent influence of aspect no correlation was obtained between the various factors examined and the percentage "take".

An extension of this work was carried on in central and north Queensland. Trials at Yeppoon in 1960 investigated, amongst other things, the possible influence of diurnal variations in sunlight at the time of treatment. There was a general tendency for treatment to be more effective when applied in the morning than in the afternoon, but within the limits tested, artificially varied incidence of sunlight did not appear to influence the effectiveness of treatment.

The possibilities in this field will need to be further examined.

Control of Fruiting with Hormones.—Investigations carried out several years ago showed that fruit maturity may be delayed up to 10 days by treating with ANA at 100 p.p.m. 8 weeks in advance of normal maturity. The more valuable result of this treatment is an increase in fruit weight of 20 per cent. in a summer crop and 12 per cent. in a winter crop. This work has been extended over a period of years and original results have been confirmed.

So far no method has been evolved whereby flowering may be delayed. Various hormone treatments investigated have failed to achieve the desired result. In 1957, a trial was laid down at Maroochy Experiment Station to investigate the effect of high nitrogen fertilizing on flowering. There are indications that this line of attack may give some results, but further work will be required.

Plant Size in Relation to Fruit Size.—It is generally accepted that small plants produce small fruit, but the exact relationship between plant and fruit size has not been determined under varying Queensland conditions. Investigations are now in progress at Maroochy Experiment Station and Yeppoon to correlate plant size at forcing with resultant fruit weight. It is hoped by this means to establish a standard of plant size to serve as [illegible] in applying forcing treatments which will [illegible] the production of [illegible] fruit [illegible] planned cropping programme.

Planting Material.—Since 1957, trials have been in progress at [illegible] Research Station [illegible] examining the influence of type of planting material, size of plants and planting time on cropping behaviour. When planted at the same time (March in southern Queensland), the larger the planting material the earlier they flowered and matured its fruit. In north Queensland, using slips only and with a [illegible] size range, the differences were much more marked. In this case both 16 oz. and 24 oz. slips cropped much sooner than 8 oz. slips. Here, too, an increased plane of nutrition favoured more rapid growth and the production of larger fruits.

Where tops, slips and suckers of equal size were compared, [illegible]. Neither size nor type of planting material had any significant effect on yield in the plant crop.

A more recent trial, planted in 1959, follows on from these results and includes a range of planting times and times of forcing as well as size and type of plant. The primary object is to determine the extent to which cropping can be spread in spite of the seasonal limitations operating in southern Queensland.

Fruit Quality

[illegible]

Fertilizer and Fruit Quality.—[illegible] north Queensland [illegible] southern Queensland and [illegible] north Queensland indicate that this condition may be improved by the use of a higher level of potash in the fertilizer schedule.

Attempts have also been made to determine the extent to which nutritional factors influence internal fruit colour. Results so far obtained have failed to establish any correlation whatever. An examination of fruit from certain pineapple clones showed marked variability in internal colour within the one clone. The experience in this work confirms the original fear that techniques used for estimating colour are inadequate. Therefore, before any further work along these lines can be carried out it will be necessary to assess the relative importance of juice pigment and translucence in determining fruit colour.

Blackheart.—Investigations into the disorder known as blackheart have been carried out over a long period and have as yet failed to establish the precise cause or the factors involved in its incidence. It is quite evident that it is a winter disorder, apparently rather more prevalent in wet winters than in dry ones. If it can be assumed, as seems most likely, that it is induced by seasonal factors as yet unspecified, the only practical solution is to avoid cropping during the critical period. It then becomes a question of crop management to avoid winter cropping.

Economic Importance of Results

Two major factors threaten the stability, and possibly even the survival, of the Queensland pineapple industry. They are declining soil fertility in the older established areas and decreasing margins between crop returns and production costs. The situation is aggravated by the relatively small size of farm units necessitating a high profit margin.

The effects of a decline in soil fertility, since it is a gradual process, are less obvious than a sudden drop in fruit prices, and are often overlooked. Contour planting, which is now a regular practice, can do little to repair the damage already caused by soil erosion, but does minimise further loss of fertile surface soil. As the trials have shown, fertility of the remaining soil can be maintained, and perhaps to some extent restored, by green manuring. This entails a longer cycle and, where there is limited suitable land on the farm, necessitates a reduction in the acreage under crop at any one time. However, the yield difference of 10 to 13 tons to the acre over a 2-crop cycle is more than sufficient to compensate for this.

The fundamental requirement of profitable production is maximum annual yield per acre. With closer planting, the same number of plants and quantity of fertilizer are required to produce a ton of fruit as with normal spacing, but the yield from an acre is increased by 30 per cent. This involves no increase in capital cost or in the cost of cultural operations, and represents a net gain of some magnitude. Control of fruiting with hormones, used judiciously, provides a means of reducing the length of the crop cycle and thereby increasing the annual yield. At the present time this system has its limitations and breaks down unless the plants to be forced are of adequate size at the time of treatment.

The work on planting schedules aims at determining the influence of varying planting times and different types of material on time of harvest. To provide a basis for crop management along these lines, data are being obtained on the relation between size of plant at forcing and resultant fruit size. When completed, this work should provide a better basis for effective control of cropping than is possible at present.

Nutritional investigations have aimed at reducing production costs by more efficient fertilizer usage. The economy effected with a pre-plantin application supplemented by foliage spray amounts to about £50 per acre over the 2-cro cycle, which is about half the cost of fertilize normally applied to the base leaves. This syste of fertilizing also entails less labour and the spee of applying the foliage sprays enables this operation to be carried out promptly on schedule.

Fruit quality investigations, though necessar from several points of view, have limited practic application at the present time, as no premiu is paid for internal fruit quality in the pric structure. Although the cause of blackheart ha not yet been satisfactorily established, the proble cannot be regarded as of major importanc Although losses may be heavy during a limite period in the winter, statistics show that to dat they have not exceeded 1 per cent. of the tot crop in any year.

The recession in prices sustained by the pineapple industry over the past two years has force growers to seek ways and means of reducin costs. Advances made in the past five years b way of increased yields and lowered productio costs have helped the industry and a wide application of the results of this research shoul improve the position.

[This review covers work in all parts of the Sta carried out by or under the supervision of Messr H. M. Groszmann, F. W. Berrill, W. V. Mungome S. E. Stephens and the author.]

It's Net Returns That Count!

Gross returns can be very unreliable guides to the productivity of a farm, or the profitability of a management practice. The only worthwhile yardstick is the net return, which is the difference between gross returns and costs.

Despite this, we frequently hear of management practices being praised because they have increased production. Next time you hear this, find out what the extra costs were. It's quite possible that the net income has increased, too, but it doesn't necessarily follow.

More serious is the widespread practice of buying and selling farms on the basis of gross returns. A prospective buyer should insist on the full disclosure of all the costs that have been incurred in obtaining these returns.

We have heard lately of two farm sales where the purchasers were satisfied to pay on the basis of gross returns. In both cases, the seller decided more than a year in advance that the were going to sell their farms, and set ou deliberately to inflate their returns.

One, a dairy farmer, culled and replaced th bottom 25 per cent. of his milkers each mont for one year. He also bought heavy supplies o supplementary feed. This gave a terrific boos to his production. It also cost him a prett penny, but he had no difficulty finding a buye who looked no further than gross returns.

The other farmer spent his year in buying u pigs in advanced stages of growth. He got hi price, too. He found a buyer who was mos impressed by the turnoff of pigs and didn't thin of looking any further than gross returns.

—*E. O. BURNS, Senior Agricultural Economist.*

Sources Of Milk Contamination On Farms

y V. R. SMYTHE, Senior Bacteriologist, Dairy Research Branch.

A study of the sources of milk contamination n Queensland farms has been found necessary order to correct quality problems which occur om time to time in milk and cream.

The results set out have been obtained on nalysis of samples taken at dairy farms in ueensland. These results show the relative mounts of bacterial contamination which riginate from various sources on the farm and e influence of the contamination on the ethylene blue test. The bacterial counts after asteurisation show the numbers of heat-resistant thermoduric) organisms present.

It will be seen that in the case of farm 1, a and milker, that a kerosene tin misused as milk receptacle imparted large numbers of acteria to the milk as did an improperly cleansed an and the hands of the milkers.

In the case of farms 2 and 3 the milking achines were obviously at fault; while in the ase of farms 4 and 5, milk cans and milkers' ands gave contamination.

For this work it was necessary to draw milk aseptically. This was done in the following manner:

After the teats were thoroughly washed with strong chlorine solution and dried, the cows were milked by hand taking care not to allow the fingers to touch the end of the teat. The first 8 to 10 streams of milk were drawn to flush out the teat canal and this first milk discarded. Milk was then drawn into a sterile narrow-necked vessel without including the strippings.

Milk obtained in this way carries a very low bacterial population and may for convenience be referred to as aseptically-drawn or near-sterile milk. When this milk is used to rinse equipment any added bacterial contamination can be discerned simply by comparison with the near-sterile control.

In obtaining the test results, the aseptically-drawn milk from the udders of several healthy cows was used to rinse the various items of equipment. In the case of the milkers' hands the milk was used as a hand wash while in the case of the water supply a portion of water was mixed with a measured portion of the near-sterile milk.

DATA FROM FIVE FARMS

FARM NO. 1

Surface, &c., Sampled	Sampling Treatment	Methylene Blue Test (hours)	Bacterial Count per ml.	
			Raw	After Laboratory Pasteurization 63°C. for 30 min.
Control milk, drawn aseptically	..	9¼	30	4
Kerosene tin	Milk rinse, 100 ml.	4½	32,000	800
Can A	Milk rinse, 200 ml.	4¾	33,000	500
Can B	Milk rinse, 200 ml.	5¾	5,000	600
Can C	Milk rinse, 200 ml.	6¾	..	1,900
Cooler	Milk rinse, 200 ml.	7¼	300	25
Udder cloth	Sterile tin wiped with cloth, then rinsed with 50 ml. milk	5¾	4,500	20
Utensil brush	Milk rinse, 50 ml.	6¾	12,000	700
Milker A's hands immediately after washing udder	Milk rinse, 200 ml.	5¼	9,000	100
Milker A's hands half-way through milking one cow	Milk rinse, 200 ml.	5	46,000	130
Milker B's hands immediately after washing mud-coated udder	Milk rinse, 200 ml.	5¼	5,000	180
Air on feed platform	50 ml. milk exposed for 5 min.	7¼	400	6
Air under cow being milked	50 ml. milk exposed for 4 min.	7½	1,500	4
Air in bails	50 ml. milk exposed for 5 min.	6½	730	20

FARM NO. 2

Surface, &c., Sampled	Sampling Treatment	Methylene Blue Test (hours)	Bacterial Count per ml.	
			Raw	After Laboratory Pasteurization 63°C. for 30 min.
Control milk A, drawn aseptically	..	9	1,000	0
Control milk B, drawn aseptically	..	9+	1,000	0
Milking machine	Milk A rinse, 1,700 ml.	3½	216,000	43,000
Can	Milk B rinse, 200 ml.	6½	47,000	8,000
Strainer	Milk B rinse, 100 ml.	7½	20,000	5,000
Vat	Milk B rinse, 200 ml.	9+	5,700	0
Cooler	Milk B rinse, 100 ml.	8¼	84,000	6,500
Udder cloth	Sterile tin wiped with cloth, then rinsed with 50 ml. milk B	8½	336,000	5,500
Milker A's hands	Milk B rinse, 200 ml.	6¼	260,000	1,400
Milker B's hands	Milk B rinse, 200 ml.	7½	184,000	5,000
Tank water	1/10 ml. in 10 ml. milk B	9+	3,000	..
Air under cow being milked	50 ml. milk B exposed for 5 min.	9+	1,000	5
Air in bails	50 ml. milk B exposed for 5 min.	9+	1,700	0
Feed dust	50 ml. milk B exposed for 5 min.	9+	1,200	5

FARM NO. 3

Surface, &c., Sampled	Sampling Treatment	Methylene Blue Test (hours)	Bacterial Count per ml.	
			Raw	After Laboratory Pasteurization 63°C. for 30 min.
Control milk A, drawn aseptically	..	9+	350	5
Control milk B, drawn aseptically	..	8¾	550	5
Milking machine	Milk A rinse, 1,700 ml.	2¼	2,000,000	58,000
Can	Milk B rinse, 200 ml.	7¼	53,000	20,000
Strainer	Milk B rinse, 100 ml.	9	1,500	150
Vat	Milk B rinse, 200 ml.	8	8,800	50
Cooler	Milk B rinse, 100 ml.	8¾	3,000	20
Udder cloth	Sterile tin wiped with cloth, then rinsed with 50 ml. milk B	7¾	900	25
Vat rag	Sterile tin wiped with cloth, then rinsed with 50 ml. milk B	8½	900	35
Milker's hands	Milk B rinse, 200 ml.	5½	25,000	750
Tank water	1/10 ml. in 10 ml. milk B	9	1,400	..
Air under cow being milked	50 ml. milk B exposed for 5 min.	8½	580	10
Air in bails	50 ml. milk B exposed for 5 min.	9	750	5

FARM NO. 4

Surface, &c., Sampled	Sampling Treatment	Methylene Blue Test (hours)	Bacterial Count per ml.	
			Raw	After Laboratory Pasteurization 63°C. for 30 min.
Control milk A, drawn aseptically	..	..	55	..
Control milk B, drawn aseptically	..	9½+	100	5
Milking machine	Milk A rinse, 1,500 ml.	8	3,200	2,000
Can A	Milk B rinse, 200 ml.	6½	28,000	24,000

DATA FROM FIVE FARMS—*continued*

Surface, &c., Sampled	Sampling Treatment	Methylene Blue Test (hours)	Bacterial Count per ml.	
			Raw	After Laboratory Pasteurization 63°C. for 30 min.
	FARM NO. 4—*continued*			
n B	Milk B rinse, 200 ml.	5¼	200,000	21,000
der cloth A	Sterile tin wiped with cloth, then rinsed with 50 ml. milk B	9½	300	0
der cloth B	Sterile tin wiped with cloth, then rinsed with 50 ml. milk B	9½+	370	10
lker A's hands	Milk B rinse, 200 ml.	5½	32,000	3,400
lker B's hands	Milk B rinse, 200 ml.	5¼	37,000	..
nk water	1/10 ml. in 10 ml. milk B	9	1,400	..
under cow being milked	50 ml. milk B exposed for 5 min.	8½	4,500	500
in bails	50 ml. milk B exposed for 5 min.	9	140	0
lk milk entering can	..	6½	45,000	7,000
	FARM NO. 5			
ntrol milk drawn aseptically	..	9+	45	0
n A	Milk rinse, 200 ml.	7½	84,000	33,000
n B	Milk rinse, 200 ml.	6½	81,000	20,000
cket	Milk rinse, 100 ml.	6½	11,400	100
t and cooler	Milk rinse, 200 ml.	9+	400	20
der cloth	Sterile tin wiped with cloth, then rinsed with 50 ml. milk	5¼	7,000	150
lker's hands immediately prior to beginning milking	Milk rinse, 200 ml.	5	52,000	150
nk water	1/10 ml. in 10 ml. milk	9+	10,000	..
under cow being milked	50 ml. milk exposed for 5 min.	8	250	20
in bails	50 ml. milk exposed for 5 min.	7	9,000	10

* * *

Queensland Pocket Year Book, 1960

The eleventh (1960) issue of the Queensland Pocket Year Book will be of value to all ersons interested in the political, business, and social life of the State. The new issue follows he pattern of the 10 previous issues as a small reference book of Queensland statistics. It rovides the latest available statistical information on all the matters included in the earlier issues, ncluding in most cases the financial year 1958-59 or the calendar year 1959.

Copies may be obtained from the Office of the Deputy Commonwealth Statistician at a ost of 1s. 6d. each, or 1s. 11d. when posted.

Brucellosis-Tested Swine Herds

(As at 1st October, 1960)

Berkshire

Bernoth, B., Wyreema
Clarke, E. J., Mt. Alford, via Boonah
Cochrane, S., "Stanroy", Felton
Cook, F. R. J., Middle Creek, Pomona
Crawley, R. A., Rockthorpe, Linthorpe
Edwards, C. E., "Spring Valley" Stud, Kingaroy
Farm Home For Boys, Westbrook
Fletcher, A. C., "Myola" Stud, Jimbour
French, A., "Wilson Park", Pittsworth
H. M. State Farm, Numinbah
H. M. State Farm, "Palen" Stud, Palen Creek
Handley, J. L., "Meadow Vale", Lockyer
Handley, G. R. "Lochlyn" Stud, Lockyer
James, I. M. (Mrs.), "Kenmore" Stud, Cambooya
Kath, E. E., "Topcamp", via Toowoomba
Kimber, E. R., Block 11, Mundubbera
Law, D. T., "Rossvill" Stud, Aspley
Lees, J. C., "Bridge View" Stud, Yandina
Ludwig & Sons, A. R., "Beau View" Stud, Beaudesert
O'Brien & Hichey, J., "Kildurham" Stud, Jandowae East
Orange, L. P., "Eula", Flagstone Creek
Pfrunder, P. L., Pozieres
Potter, A. J., Ascot, via Greenmount
"Tayfield" Stud, Taylor
Q.A.H.S. & College, Lawes
Regional Experimental Station, Hermitage
Rosenberger, N., "Nevrose", Wyreema
Rosenblatt, G., Rosevilla, Biloela
Schellback, B. A., "Redvilla" Stud, Kingaroy
Smyth, E. F., "Grandmere" Stud, Manyung, Murgon
Stark, H. L., "Florida" Stud, Kalbar
Thomas & Sons, F., "Rosevale" Stud, Laravale
Traves, G., "Wynwood" Stud, Oakey
Weier, V. F., "La Crescent", Clifton
Wolski, A., "Carramana", Warra
Young (Jnr.), W., Kybong, via Gympie

Large White

Assenbruck, C., Mundubbera
Barron Bros., "Chiltern Hill", Cooyar
Bell & Son, E. J., "Dorne", Chinchilla
Behm, A. M., "Aleun", Wondai
Bishop, C. E., Beerwah
Butcher, Dr. B. J. & Parnwell, A. J., Plunkett, via Tamborine
Clark, L. D., Greens Creek, Gympie
Coller, R. H., "Relloc", Tallegalla, via Rosewood
Duncan, C. P., "Colley", Flagstone Creek
Fowler, S., "Kenstan", Pittsworth
Franke, H. J., "Delvue" Stud, Cawdor
Garawin Stud Farm Pty. Ltd., 657 Sandgate Rd., Clayfield
Gibbons, A. E. H., Mt. Glorious
Gibson, H., "Thistleton" Stud, Maleny
H. M. State Farm, Numinbah
Hall, M., "Milena" Stud, D'Aguilar
Heading, J. A., "Highfields", Murgon
Hickson, K. L., "Warra", Calliope
Horton, C. J., "Mannuem Brae" Stud, Mannuem, Kingaroy
Hutton, G., "Grajea" Stud, Cabarlah
Jensen, S., Rosevale, via Rosewood
Jones, K. B., "Cefn" Stud, Clifton
Kahler, J. & S., "Karajoy", East Nanango
Kanowski, A., "Exton", Pechey
Kennard, R. B., "Collar" Stud, Warwick
Larsen, H. L., "Oakway" Stud, Kingaroy
Law, D. T., "Rossvill" Stud, Aspley
Lees, J. C., "Bridge View", Yandina
Lobegeiger, L. C., "Bremer Valley" Stud, Moorang, via Rosewo
Mack, A. J., Mundubbera
"Marcliff", Wecker Rd., Mt. Gravatt
Neilsen, L. R., "Sunny Hill," Ascot, via Greenmount
Neilsen, A. R., Ascot, via Greenmount
Palmer, V. P. & Son, "Remlap", Greenmount
Pampling, G., Watch Box Rd., Goomeri
Port Curtis Co-operative Dairy Association Ltd., Stud Pigge
Biloela
Postle, R., "Yaralla" Stud, Pittsworth
Powell, R. S., "Kybong", Gympie
Q.A.H.S. & College, Lawes
Radel, V. V., Coalstoun Lakes
Radel, R. M., Coalstoun Lakes
Regional Experimental Station, Biloela
Robinson, O. R. & O. J., "Linvale", Argoon, Biloela
Rosenblatt, G., Rosevilla, Biloela
Skyring, G. I., "Bellwood" Stud, via Goomeri
Stanton, H. R., "Lanherne" Stud, Tansey, via Goomeri
Stehn, L. W., "Hodgson Vale", via Toowoomba
Stewart, L., Mulgowie, via Laidley
Stumer, K. F., French's Creek, Boonah
Wharton, C. A., "Central Burnett" Stud, Gayndah
Wieland, L. C. & E., Lower Cressbrook, Toogoolawah
Zahnow, W., Rosevale, via Rosewood

Tamworth

Armstrong, H. J., "Alhambra", Crownthorpe, Murgon
Booth, J. D., Swan Creek, Warwick
Campbell, P. V., "Lawnhill" Stud, Lamington
Fletcher, A. C., "Myola" Stud, Jimbour
Herbst, L., "Hillbanside", Bahr Scrub, Beenleigh
Kanowski, S. E., "Miecho", Pinelands
Potter, N. R., "Actonvale" Stud, Wellcamp
Regional Experimental Station, Kairi
Salvation Army Training Home For Boys, "Canaan" St
Riverview
Skerman, D. F. L., "Waverley", Kaimkillenbun
Stephen, T., "Withcott" Stud, Helidon
Thomas & Sons, F., "Rosevale" Stud, Laravale
Wieland, L. C. & E., Lower Cressbrook, Toogoolawah

Wessex Saddleback

Ashwell, J., "Green Hill", Felton South
Cooper, G. J., Neumgua
Douglas, W., "Greylight" Stud, Goombungee
Dunlop, J. B., "Kunawyn", Acacia Rd., Kuraby
Kingsford, D., "San Antone", Toowoomba
Kruger & Sons, "Greyhurst" Stud, Goombungee
Lau, D. E., "Homevale", Goombungee
Law, D. T., "Rossvill" Stud, Aspley
Mack, A. J., Mundubbera
Scott, A., Wanstead Stud, Grantham
Smith, C. R., "Belton Park", Nara
"Wattledale" Stud, 432 Beenleigh Rd., Sunnybank

Landrace

Ashwell, J., "Greenhill", Felton South
Behm, A. M., "Aleun", Wondai
Crawford, G. L., "Glenvillan", Manneum
Crothers, B. M., "Booligar", Clifton
Duncan, C. P., "Colley", Flagstone Creek
Fowler, K. P., "Northlea", Coalstoun Lakes
Grayson, D. G., Killarney
Itzstein, R. A., "Hyde Park", Gooroolba
Jensen, A. P., & Grace, V. S., Theodore
Kath, E. E., "Topcamp", via Toowoomba
Kingsford, D., "San Antone", Toowoomba
Law, D. J., Rossville Stud, Aspley
Lusk, P. B. and I., Westbrook
Neilsen, A. R., Ascot, via Greenmount
Neilsen, L. R., "Sunny Hill", Ascot, via Greenmount
Orange, L. P., "Eula", Flagstone Creek
Semgreen, A. L. & D. T., "Tecoma", Kingaroy
Stehn, L. W., "Hodgson Vale", via Toowoomba
Stummer, K. F., French's Creek, Boonah

Large Black

Pointon, E., Goomburra

orchard and garden

Control of Macadamia Pests.—Pests of macadamia nuts are attracting more attention because of an increase in commercial production. Records of minor pests are accumulating but only three species have so far been troublesome. These are the macadamia flower caterpillar, the fruit spotting bug and the macadamia nut borer.

The flower caterpillars are small pale-brown grubs which feed on the flowers and web dead fragments along the flower stalks.

The fruit spotting bugs are orange and black when small; pale-brownish-green and half an inch long when full-grown. They attack young to well-developed nuts and by piercing them to the kernels cause many to fall prematurely, others are malformed.

The nut borers are small brownish-coloured grubs which eat neat round holes through the shells of well-developed nuts and then devour the kernels.

Each of these pests can be controlled by a 0·1 per cent. DDT spray. In each instance one thorough application should be effective. Observations will then determine the need for repeat treatments.

—Dr. A. R. BRIMBLECOMBE,
Senior Entomologist.

Grape Varieties on the Coast.—Despite climatic conditions which are not entirely satisfactory an appreciable commercial acreage of grapes is grown in coastal Queensland.

Expert vineyard management and a sound knowledge of the vagaries of the vine are essential for economic success!

But there are compensations if you produce the crop, for coastal grapes mature early and arrive on a high-priced market from Christmas through January.

Choice of variety is important. Not all do well; only very few are worth consideration. Happily, two excellent black European varieties—namely Muscat Hamburg and Black Hamburg—have proved suitable for the coast and should comprise the bulk of coastal vineyard plantings. The Black Hamburg is the heavier cropper; Muscat yields are normally lower but this variety produces a superior berry of higher market value. For a very early lead-up harvest, many growers plant a white grape such as Chaouch, which is quite saleable on a bare market prior to Christmas.

On light sandy soils, it is advisable to graft the Hamburg types on to vigorous Phylloxera-resistant rootstocks. On their own roots in such soils, vine growth is rather weak but rootstocks such as Rupestris du Lot will impart vigour to the vine. On heavier, fertile soils, the Hamburgs grow well on their own roots and grafting is considered unnecessary.

—D. DOWDLES, Adviser in Horticulture.

Marketing Tomatoes.—The general marketing and presentation of tomatoes plays an ever-increasing part in determining the financial result growers will receive for their hours of arduous toil, and money invested, to produce crops. Grade standards have been defined by the Standards Branch of the Department of Agriculture and Stock in order to maintain that standardisation of quality which is vital to the stability of the industry.

In short the grade standards for tomatoes provide that the fruit shall be graded as A or B grade quality and be properly packed in even sizes. Cases are to be clean and packing paper shall be clean and new. Cases shall be branded with grower's name and address and marked with the size and grade of fruit contained in each case.

There are still growers who market tomatoes in unbranded cases, cases showing old brands and cases which have not been marked with the grade or size. These factors only cause confusion and delay as market inspectors withhold these consignments from sale until the cases are correctly branded and marked. Good growers are invariably proud of their produce and prominently mark and brand their packages.

Copies of the grade standards for tomatoes are available on request from the Department of Agriculture and Stock.

—*C. M. APPS, Market Inspector.*

Banana Fertilizing in the North.—Recent work in banana nutrition in North Queensland has produced evidence that the potassium requirements of the plant are often inadequately provided for.

This is particularly the case on old land that has been under pasture or weed growth or that has been heavily cropped for some years without adequate replenishment of plant nutrients. It also occurs, however, on comparatively new land that is naturally deficient in potassium.

In past years banana growing in North Queensland has been an itinerant industry. With plenty of rich scrub land available it was the custom to clear a piece of virgin scrub and grow two or three crops of bananas, then, when the quality of the fruit began to deteriorate, to move to a new piece of scrub and repeat the process. With the rich alluvial lands then available this method of culture was quite satisfactory, even without the use of fertilizers. However, in the past decade the availability of new scrub land has become less and less so the industry has had to become a static one with the soil deficiencies being made good by fertilizing.

A fertilizer mixture commonly used by commercial banana growers in the wet tropics has a formula of 7:10:10 and this has been generally used at the rate of up to 3 lb. per stool per year to produce fruit of satisfactory quality. However, in some instances results have been far from satisfactory on this programme. Plant growth in the early stages has been good o many of the affected plantations, and then the end of the wet season when the plants hav almost reached the stage of bunching the leave have started to turn yellow. Bunches of goo size may be thrown but it is obvious right fro the start that the fruit is pinched and will n develop. Practically no fruit has been harveste from these plantations.

In trials carried out by the Department o Agriculture it has been found that even 5 t 6 lb. of fertilizer with 7:10:10 formula has n corrected the trouble. But when the amoun of potassium was increased so that the rati between potassium and nitrogen was of the orde of three or four to one then the symptoms o failure of the plants did not appear. This follow the experience in overseas banana countrie where mixtures of the order of 8:8:24 ar commonly used.

On the evidence of our recent trials it seem likely that banana growers in North Queenslan would be wise to change over from 7:10:10 t mixtures such as 5:9:17 or 5:8:23. Both o these are commercial mixtures and should b readily available.

—*S. E. STEPHENS, Horticulturist.*

Studies on Fruit Juice Flavour.—Studies aim at retaining all the flavour of farm-fresh fruit i pineapple juice sold in Queensland have begun a the Agriculture Department's new Hamilto Food Preservation Laboratory. These investiga tions are the start of a plan to increase the con sumption of pure fruit juice.

The Minister for Agriculture and Forestr (Hon. O. O. Madsen, M.L.A.) said there i evidence that markets for pure fruit juice can b expanded. However, expansion of market would require the juice to be of good quality an the price within the reach of the consumer.

In overseas countries, these conditions ar being met by concentrating the juice to reduc freight costs and using methods to retain th flavour.

At Hamilton, a special evaporator capable o converting five gallons of juice into one gallon of concentrate is now being built. The evaporator has extra equipment to recover an flavouring substances lost in concentration

These substances are then returned to the concentrated juice.

It is known that the flavour of pineapple juice varies according to the season. There is a greater concentration of flavouring substances in summer pineapples than in the winter crop.

As a preliminary step in the concentration process, a detailed study is being made of the flavouring substances in pineapple juice. During the 1960-61 summer crop, fruit sent to the Northgate Cannery will be sampled and tested at regular intervals.

Mr. Madsen said although the studies are being made on pineapples, the basic information obtained could be used in concentrating the juice of any fruit. As a demand for concentrated fruit juices develops, citrus, grape, passion fruit, apple and tomato juices would also be prepared.

Fertilizing of Strawberries. Work on strawberry nutrition has been in progress at the Redlands Experiment Station since 1955. Initially, the aim was to determine the responses, if any, to applied nitrogen, potassium and trace elements, molybdenum, copper, zinc and boron. Trials in 1955 indicated that high levels of potassium increased the number of berries but reduced berry size and overall yields were not affected. In addition, high levels of nitrogen reduced yields which suggests that some care is necessary in using nitrogenous fertilizers. No response was obtained from any of the trace elements even though some, such as molybdenum, are in short supply in the soils at the Station.

In the following year, rates and times of application for side dressings were investigated. All plots receive a basal application of 4-12-12 mixture at a rate of 15 cwt./acre before planting. Side dressings ranged up to luxury levels of a soluble 4·5-12-6 mixture with successive applications at 2, 4 and 8 week intervals. Yields were approximately 20,000 lb. per acre and 95 per cent. of the berries harvested were marketable. It was concluded that side dressing schedules based on application of 4 cwt./ acre at intervals of 4 weeks from the commencement of flowering are suitable for commercial production. Quantities in excess of these amounts are probably wasted.

In 1959, the nutritional trial was designed to check the influence of superphosphate in both basal and side dressing fertilizers (the soil is well supplied with phosphate by analysis) and also the influence of nitrogen and potassium in side dressing fertilizers. Marked responses were obtained to applied superphosphate and this was due to the increased number of berries harvested rather than any increase in berry size. The response to superphosphate in the side dressing was rather unexpected as this nutrient is normally "fixed" near the surface of the soil. The crop, however, was mulched and root development close to the surface probably enabled the plants to use it. Nitrogen in side dressings increased yields, but applications at rates in excess of 20 lb. of nitrogen per acre were wasteful. Yield increases due to side dressings of nitrogen amounted to 27 per cent. of the harvested crop.

It is concluded that:—

(*a*) Moderate quantities of nitrogen and large amounts of superphosphate are required in the basal fertilizer; the potassium requirement is small in a soil already well supplied with this element;

(*b*) Frequent light applications of nitrogen are needed in side dressing fertilizers;

(*c*) The current recommendation of 15 cwt. 5-13-5 for the basal dressing and side dressings of 5-13-5 (soluble) at 4 cwt. per acre (2 lb. per chain-row) every 4 weeks from the commencement of flowering should be adequate on most soil types.

(*d*) The response to superphosphate should be further investigated. It may, in part, be due to elements such as sulphur or calcium in the fertilizer.

K. M. WARD, Senior Horticulturist.

For Country Cooks

Notes from the JUDITH MAY TEST KITCHEN directed by Ruby Borrowdale for the Butter Marketin Board.

A Meal On Toast

Hot buttered toast is a food everybody enjoys and when you combine toast with tasty sandwich fillings you really have something. You can serve a meal after the evening's entertainment by using toast and sandwich fillings and find that economy and variety can be combined in a really enjoyable snack. Leftovers of chicken, pork, lamb, beef and fish will lend themselves admirably to this form of serving and the addition of a touch of chutney, mushrooms, cheese onions, olives, capsicum, and so on, will provid all the glamour needed to transform an ordinar sandwich supper into a delightful meal.

When sandwiches are to be dry-fried, plac the prepared filling between unbuttered brea and then melt the butter in the frypan; fry sandwiches till golden on both sides, turning wit spatula or egg slice. Serve hot from the pan

Toast 3 slices of bread, and butter one side of each piece. Cover 1 slice with crisp lettuce, letting it extend beyond the edges. Arrange slices of left-over chicken, duck, pork or any desired meat on top of lettuce; spread with garden vegetable sauce (recipe follows) and cover with second piece of toast; place slices of onion, tomato and hard-cooked egg on this, season to taste and cover with third piece. Press together and cut into triangles and serve while toast is hot. If filling is plentiful and bulky, it may be necessary to fasten the triangles with toothpicks.

GARDEN-VEGETABLE SAUCE

Two tablespoons butter, 2 tablespoons finely chopped celery, 2 tablespoons grated onion, 2 tablespoons chopped green capsicum and 1 cup tomato sauce. Melt the butter in a small saucepan. Add celery, opion, and capsicum. Cook until soft, but not browned. Add tomato sauce; and heat. Turn into glass jar, cover when cold.

Note: This sauce can be used in place of mayonnaise for binding all sandwich fillings. It is especially good with canned fish. When serving hamburgers on toasted buns, serve this sauce hot over the hamburgers.

OLIVE CLUB SANDWICH

Substitute sliced hard-cooked eggs for the meat or poultry in the olive club sandwich; sprinkle chopped ripe olives over thinly sliced tomatoes on the second layer.

ASPARAGUS THREE-DECKER

Heat asparagus tips in their own liquid then drain well. Spread 6 tips between 2 slices of buttered toast, smear lightly with prepared mayonnaise. Spread top of sandwich with mayonnaise and cover with chopped tomatoes, pearl pickled onions and 2 slices of crisp bacon. Cover with third piece of toast and serve with a garnish of mustard pickles or sliced gherkins.

SPANISH SANDWICHES

Six slices buttered toast, 1 tablespoon butter, 1 cup grated tasty cheese, 2 tablespoons chopped green capsicum, 2 tablespoons chopped onion, 1 cup thick tomato pulp, ½ teaspoon salt, dash of paprika, 1 beaten egg. Fry the capsicum and onion in the butter for 5 min.; add tomato pulp, cheese, salt and paprika and cook 5 min. longer, or until cheese is just melted. Stir a small amount of this mixture into beaten egg; return to hot mixture and cook 2 min. longer; serve on hot toast. Makes about 6 servings.

Note: To make the thick tomato pulp from fresh home-grown tomatoes, place the required number of ripe tomatoes in a large bowl and cover with boiling water. Cover and let stand about 3 min. Drain water off and remove skins with sharp knife. Cut peeled tomatoes into halves and squeeze gently to remove seeds. Then chop flesh and measure. When tomatoes are prepared this way they impart brighter colour, better flavour and thicker consistency to all savoury sauces and fillings.

CHEESE DREAMS

Spread 6 slices of bread with peanut paste; top each with a slice of cheddar cheese, then with another slice of bread. Press well together, trim crusts and cut into triangles. At serving-time melt some butter in a heavy frypan and fry the sandwiches until golden brown on both sides; serve immediately.

Note: The sandwiches can be prepared well ahead of serving-time, wrapped in aluminium foil or waxed paper and then cooked when required. During the colder months it is not necessary to refrigerate them.

OPEN-FACE SANDWICH

Four slices bread cut about ½-in. thick and crusts removed, 8 teaspoons salad dressing, 1 large tomato (peeled), sliced cheddar cheese. Toast slices of bread on one side only. Spread the untoasted sides with mayonnaise or boiled salad dressing. Place on each a slice of tomato and then cover entire surface with thinly-sliced cheese. Place under medium-hot griller for about 5 min. until cheese melts and starts to brown. Serve immediately. Serves 4.

Note: A white or cream sauce to which has been added some cooked cauliflower, cooked green peas, boiled onions or asparagus tips makes an excellent sauce or gravy to serve over these cheese-tomato toasts.

SWEET TOAST

Use thin slices of bread toasted quickly; remove crusts, cut in strips, triangles or other shapes, and spread with butter. Sprinkle or spread with one of the following mixtures and place under the griller or in a moderate oven to melt the sugar. Serve hot for breakfast or supper snacks.

Cinnamon Toast: Add ½ teaspoon powdered cinnamon to every ¼ cup white or brown sugar. Place in sugar shaker and sprinkle over prepared toast.

Orange Toast: Add 2 teaspoons grated orange rind and 2 tablespoons orange juice to every ½ cup sugar.

Banana Toast: Mash 3 ripe bananas, add 1 teaspoon lemon juice, 1 tablespoon sugar and 1 tablespoon softened butter. Mix well and spread over slices of unbuttered toast. Place in hot oven for about 5 min. Serve hot with cream, if desired. This makes a rich, tasty treat for children.

Honey Cinnamon Toast: Mix equal amounts of warmed honey and butter and spread on unbuttered toast; sprinkle with cinnamon, if desired. Serve hot.

FRENCH TOAST

Some people like French toast very soft, as when made with more milk and less egg; others prefer it rather crisp as made with more egg a less milk. The choice depends on your o taste and the egg supply.

Soft Style: Two eggs just slightly beaten wi a fork, few grains salt, few grains nutmeg, 1 c fresh milk and 6 slices of bread (cru trimmed), butter or Ghee for frying. M together the eggs, salt, nutmeg and milk in deep plate or shallow dish. Heat the frying p and melt sufficient butter or Ghee in it to cov the bottom, but do not let it brown. Cut slic of bread into halves. With a fork, dip quick in and out of the egg batter. Drain a mome then fry quickly in the hot butter until gold brown on both sides; turning with egg slice spatula. Serve plain or with grilled bacon, ha or sausages. Or as a sweet with honey, jam jelly.

French Toast Crisp-Style: Follow the abo recipe using 3 slightly beaten eggs to the cup milk instead of 2 eggs.

FRENCH TOASTWICHES

Make thin sandwiches of either white brown bread, using minced cooked poultry, ha tongue, luncheon meat, peanut paste or tas cheese as fillings. Dip with fork into the Frenc toast batter and fry quickly until golden. Ser as a hot snack for breakfast, lunch or supp They are excellent with thin soups or salads.

* * *

The Word "Broiler"

An organisation has been formed in Britain to promote chicken as a food, and to end the confusion in the public's mind over the word "broiler". This word in America describes a plump young chicken.

The Chicken Information Council was set up by the British Broiler Growers' Association, to be responsible for all the Association's publicity activities on behalf of the chicken industry.

In a survey, 160 London housewives were interviewed. One-third of those questioned had no idea what "broiler" meant. When told that it was a chicken and asked what type, only 2 replied that it was a young chicken. Fifty sai it was a boiling bird. Others described it as a old chicken, a steam roaster and a slow roaste Only one housewife in 10 interviewed kne that a broiler was a young chicken. "We hop to replace the word 'broiler' by something whic everyone understands—and enjoys," said M Pendry, chairman of the new Council.

A new slogan for the industry was suggested "Chicken—the treat you can afford."

Buying Baby's Clothes

Baby clothes are always pretty—but remember they need to be practical.

With baby-clinics to advise, specially for the first-born, and with today's textiles and fancy-stitching sewing machines, there is no reason why they can't be both pretty and practical.

Here are some reminders for mothers-to-be, mothers and gift givers:

Baby's clothes should be comfortable. Materials should not be harsh, and there should be no lumpy buttons or decorations to hinder comfort when lying down.

Clothes should be warm, but not too warm, therefore material should be porous.

Choose fabrics that are easy to wash, dry and iron. For nightwear try to use flame-resistant fabrics.

They should be easy to put on and take off, especially for small babies. Choose nightgowns, underclothes and dresses that open well down the back or have a good head opening. Crossover styles are best for the new baby.

Avoid tight sleeves. Get raglan or magyar sleeves wherever possible, especially for coats.

Allow for growth. Choose clothes with good hems and side seams; babies grow fast, so do not overburden yourself with first-size garments.

Buy hats or bonnets that cover the ears for really cold weather.

Shoes should be broad enough, as well as long enough, particularly near the toes.

Tight socks and bootees are as bad for the feet as tight shoes.

When you buy brightly-coloured clothes, make sure that the dyes are fast.

See that tape or ribbon fastenings are securely attached to the garment so that they cannot be swallowed.

Proper Room Lighting

"Can you see, to do more than talk, in your lounge, living, and bedroom? By see, is meant REALLY SEE to read, write, or sew, or to be sure make-up is correct."

The usual central light rarely gives adequate lighting at all points of a room.

This fault can be overcome by installing fluorescent lighting as may be seen now in many kitchens.

Another solution to inadequate lighting is to provide standard or table lamps which can be placed in exactly the right spot to give the extra light so necessary for close work if eyestrain is to be avoided.

General lighting is still essential when working by a lamp, to prevent added strain on the eyes.

If the rest of the room is unlit the eyes have to accommodate themselves to a different set of lighting conditions each time the glance moves outside the circle of lamp light and again when it returns to it.

Today's lamps are generally both useful and decorative.

Choose a lamp tall enough to spread a generous circle of light on what you wish to see.

The shade should be deep enough to cover the light bulb, and dense enough to conceal its lighted outline.

A light lining to the shade is recommended because a dark-coloured lining absorbs much of the light.

The lamp should be equipped with a translucent reflector bowl under the shade. The bowl provides a combination of upward and downward light that eliminates annoying glare, disturbing shadows, and too-sharp contrasts.

A shade with a wider diameter at the base than at the top is to be preferred as it "spreads" the light.

Washing Terylene Curtains

Washing of terylene curtains should not cause bother or anxiety, for terylene is one of the easiest to care for of the man-made fibres.

The following suggestions for general care and laundering have been provided by Miss Nancy Foskett, Senior Extension Officer, Women's Service, New South Wales Department of Agriculture:

Despite the ease of washing terylene curtains, they should not be allowed to become too soiled.

If they do, soak them in a warm solution of detergent and water. Drain off this water before washing the curtains; squeeze—*do not wring*—excess water from them.

Terylene is a tough fabric and it can be washed in hot water with soap powder or a soapless detergent.

Water temperature of from 140 to 170 deg. F. is recommended.

At temperatures higher than this the material may crease permanently, and for this reason terylene should never be boiled.

If the curtains are washed in a machine, wate can be used hotter than the hands could bea but the curtains will then probably need som ironing.

On no account should they be wrung or spu

Where the curtains are washed by hand, hotte water can be used if rubber gloves are worn.

Rinse the washed curtains thoroughly, an hang them to drip dry; do not squeeze, spin, o wring them while they are hot and wet.

Some weaves of terylene net look better fo a little ironing with a cool iron.

If, despite careful and frequent washing, th curtains become discoloured after a time, on of the special preparations on the market fo whitening synthetic fabrics can be used wit some success.

Follow the instructions carefully, and use large tub to keep creasing to a minimum.

The preparation should be used after each wash, as the effect is cumulative.

Do not use a chlorine bleach.

Home Fire Drills

If you awoke to-night to find your house o fire, how would you escape?

If you can't answer that question it's time yo did some serious planning. Your own and you family's lives may depend on it.

Here is the plan recommended by the Nationa Safety Council of U.S.A.:

Map out an escape route, and an alternativ one from every room in the house.

Set a meeting place for the family outside.

Decide who should help small children, old people and invalids.

Teach the family to notify the fire brigade.

In a two-storey building, or one built up off the ground, escape may be more difficult. There is a good chance that halls and stairways will be unusable for escape from fire. You may be able to escape by a porch roof under a window, or a sturdy trellis.

A rope ladder with a permanently installed hook for fastening inside the window is good for rooms with no other exit. Be sure to practise throwing the ladder out the window, and climbing down.

Teach everyone to test a door before opening it, if fire is suspected. If the panels or knob feel warm, do not open the door. Stuff a small rug or clothing along the bottom door crack to keep out smoke and flames as long as possible. If the door is not hot, open it cautiously. Turn your head away from the opening and brace yourself so you can close the door if hot air rushes in.

After mapping out your plans, practise them until they are second nature to your family. Once or twice is not enough, especially for your children. Remember, home fire drills may save your family.

Hang a Parsley Basket

These days when so many are interested in indoor gardens and indoor plants, why not include one that is as useful as it is decorative?

What about parsley, in a basket hanging in the kitchen window, or on a nearby porch or verandah, where it will get some sunshine—but not too much, because it likes some shade.

Not only will it look quite attractive, it will have the advantage of being right at hand when you want parsley.

In addition, it's more likely to flourish grown in this way, for you'll remember to keep it moist—and it won't take much in dry times to keep it growing.

Line a not-too-large basket with paper bark—or fresh moss, as some people prefer.

Fill the basket with a mixture of good garden loam, rotted animal manure, and some coarse sand to keep the soil open and well-drained.

Parsley plants don't transplant successfully, so the seeds should be sown in the basket.

Five or six plants will be all the basket can support, but sow a few more seeds to allow for a few "misses", and thin out if necessary.

Water the basket thoroughly, and keep it moist.

As soon as the plants are established and on their way, you can snip some off whenever you require it for soup, salads or savouries, for the more you pick the thicker it will grow.

While you're on the job make up a second basket, or two, for other herbs.

Many cooks also like to have a pot of chives handy—so make it a threesome.

"What Can I Do Now?"

Mothers of small children, and children home from school during holidays or because of illness, are all too familiar with this cry—repeated at incredibly short intervals.

Children use up play projects fast and mother must be ready to come up with new ones on the spur of a moment.

Provide common, ordinary materials as playthings; give him time and space; cover the floor with newspapers or something washable; cut the sleeves out of an old shirt, put it on him to button down the back, and let him have the fun of learning something new through action by doing.

Provide crayons, coloured chalk, and finger paints with a big roll of shelf paper and let him express himself to his heart's content.

Moulding-clay and dough are other excellent play materials; also provide dull-pointed scissors and scraps of coloured paper and fabric.

You can make finger paint by whipping soap flakes or wall paper paste in water and adding food colouring.

If you haven't an opportunity to buy modelling clay, make up a dough of 1 part flour to ½ part salt and ¼ part coloured water.

Make it very pliable but not sticky.

Steps, Stairs, Storage

Falls are among the commonest of home accidents—caused by lack of thought in original planning of steps and stairs; or by untidiness which may be due to lack of storage, or poor arrangement.

Some things to keep in mind regarding steps and stairs when planning a house are listed:

Avoid single steps—small changes in floor levels are dangerous, either inside or outside the house.

A minimum of three steps is desirable—except, possibly, at entrances.

If small changes in a level are necessary, a ramp can be used. Ramps are well worth considering where perambulators or wheel chairs will be used. The desirable rise for a ramp is 1·4 in. in 12—and should, in no case, be greater than 2 in 12. The desirable width is at least 3 ft. 4 in.

Landings for steps outside the house should be on the same level as the inside floor.

Handrails should be provided—at two levels if there are children in the family.

Short flights of stairs with landings are preferable to a single straight flight.

More than sixteen steps in any one straight flight is undesirable.

Height and width of steps should be uniform —6 to 7 in. riser indoors, 5 to 6 in. riser outdoors.

Open risers should be avoided.

Good lighting of stairways is essential—with a two-way switch for night lighting.

Be particular about floor covering used c stairways—do not polish it, and keep it i absolute repair.

Having a place for everything is the first ste towards having everything in its place—and things are where they belong falls will be fewe

However, storage must be planned carefull if it is to play its part in preventing falls.

Storage should fit the articles to be storec and be conveniently placed.

It is more likely that articles will be put awa if storage for them is near where they are usec

Full-height and full-front openings are desirabl

Shelving which may be adjusted to suit chang ing needs is a good investment, and all shelvin should be able to support the weight of object without sagging or tipping.

Glass shelving should be shatterproof.

See that storage space is well lighted. I internal lighting is necessary, as in a large close ensure the bulb is placed so that it cannot com in contact with inflammable material.

—New South Wales Agriculture Department's "Press Copy."

Diet and Health

For perfect health the body must have every day, the foods which (1) supply energy, (2) build, maintain and repair the body structures and (3) regulate body processes. These foods are carbohydrates and fats, proteins, vitamins and minerals.

Carbohydrates and fats, sugars, macaroni, bread and cereals, oils, pastry, butter and lard all assist in providing energy, but overconsumption of any of them induces obesity and reduces the intake of essential proteins, vitamins and minerals. Proteins also supply energy and these are found in the "protective" foods—milk, milk products, eggs, meat, poultry and fish, but they also build and repair tissue and in addition provide some of the essential vitamins and such minerals as calcium (lime) for strong teeth and bones, phosphorus (body regulating) and iro (for enriching the blood stream).

Vitamins and minerals are among the element which unfortunately tend to be most neglecte Vegetables and fruits are highly important fo supplying vitamins and the minerals mentioned

Fruit and vegetables should be eaten at ever meal, as they aid digestion and assist in regulat ing body functions.

Citrus fruits, tomatoes, pineapple, lettuce an parsley are rich in vitamin C (Ascorbic acid) Bananas contain vitamins A, B1, C and G, an also minerals; apples and pears contain calcium iron and phosphorus, also vitamins; dried fruit are rich in iron.

A Guide To Costs Of Fodder Crops And Pastures

y N. F. FOX, Agrostologist.

The production of fodder crops and the estab- hment of sown pastures are the most popular eans of supplementing native pastures during eir season of low nutritive value.

Summer-growing fodder crops are grazed during ecember and January and again in April, May d June. Oats grow well on the land which roduced the early crops and is available for azing between June and September.

But costs are an important factor in supple- entary feeding programmes, and should be given areful consideration when such programmes e planned. An attempt has been made here set out a series of standard costs which may erve as a useful guide to the individual producer. rincipal items are labour and capital costs of quipment. In the cost tables, labour with keep as been allowed for at £16 for a 40-hr. week d popular makes of machinery have been elected with depreciation and interest rates harged on the cost new. Many farmers or aziers will be able to work at costs below e standard costs calculated here.

The minimum equipment required is a medium- orse-powered tractor, a 7-ft. chisel plough and seed-fertilizer box which may be mounted on e chisel plough.

Costs of popular makes are approximately—

	£	
Tractor	1,348	
Chisel Plough	265	(complete)
Seed-box	148	
Total	£1,761	

The necessary equipment for fodder crop or own pasture establishment therefore, can be urchased new for about £1,800.

Tractor Operating Costs can be summarised as follows, assuming that the tractor and equipment have a life of 8,000 hours or 10 years.

		Per hour s.	d.
Fuel—1 gal. diesel fuel per hr. @ 2s. 6½d.	=	2	6·5
Crank case oil—2½ gal. every 200 hrs. @ 10s. 3¼d. gal. ..	=		1·54
Air cleaner oil—1 pt. every 50 hr. @ 1s. 6d.	=		0·36
Element for oil filter every 500 hr. @ 16s. 4d.	=		0·39
Elements for fuel filter every 100 hr. @ 28s. 4d.	=		0·34
Top-up oil and grease every 10 hr. @ 1s. 6d.	=		1·80
New tyres and tubes every 3,000 hr. @ £180	=	1	2·40
Repairs and maintenance 5% ..	=	1	8·20
Depreciation at 10%	=	3	3·84
Interest on capital 5% on first year on £1,348 to 5% on £135 in the 10th year	=	1	1·0
Total	=	10	2·37
Tractor driver's wages and keep @ £16 a week	=	8	
Total	=	18	2

Chisel Plough and Seed Box Costs. Capital cost is £413 and supposing they are used for the life of the tractor only.

		Per hour s.	d.
Depreciation at 10%	=	1	0·4
Interest on capital at 5% flat rate	=		6·0
Repairs and maintenance @ 5% flat	=		6·0
Total	=	2	0·4

The cost of operating the tractor with attached chisel plough and seed box will be £1 0s. 2·4d. an hour.

The 7-ft. implement should work at the average rate of 2½ acres an hour.

Cost per acre .. = £1 0s. 2·4d. ÷ 2½
= 0 8s. 1d. or say 8s. an acre

To prepare new Land after native pasture has been burned, three workings may be necessary on soils of light to medium texture.

		£	s.	d.
Cost of ploughing per acre ..	=	1	4	0
Cost of seeding	=		8	0
Cost of seed—				
10 lb. cowpea @ £2 5s. 6d. a bushel	=		7	7
6 lb. white panicum @ 9d. a lb.	=		4	6
Total	=	£2	4	1

The cost of land preparation and planting= £2 4s. 1d. per acre.

The cost of planting an early January crop of cowpeas and sweet Sudan grass on new land would be:

		£	s.	d.	
Three workings	=	1	4	0	
Planting	=		8	0	
Seed—					
10 lb. cowpea	=		7	7	
8 lb. sweet sudan ..	=		15	4	
Total	=	£2	14	11	an acre

The cost of planting an oats crop on land previously planted to cowpeas would be:

		£	s.	d.	
One working	=		8	0	
Planting	=		8	0	
Seed, 1 bushel	=		15	0	
Total	=	£1	11	0	an acre

The cost of planting a sown pasture mixture on land previously cropped to cowpea:

		£	s.	d.	
Planting	=		8	0	
Seed—					
scrobic £1 a lb.	=	3	0	0	
phasey bean @ £1 a lb. ..	=		5	0	
centro @ 6s. a lb. ..	=		18	0	
Total	=	£4	11	0	an acre

		£	s.	d.
OR planting	=	0	8	0
Seed—				
green panic @ 6s. a lb. ..	=	1	4	0
molasses @ 8s. a lb.	=		4	0
phasey bean @ £1 a lb. ..	=		5	0
centro @ 6s. a lb.	=		18	0
Total	=	£2	9	0

If a system were adopted whereby three cr were planted, and two paddocks were in each year, costs would be as follows:

		£	s.	d.	
September–October Cowpeas + white panicum crop ..	=	2	4	1	an a
January Cowpea + sweet sudan grass	=	2	14	11	an a
March–April Oats crop following early planted crop	=	1	11	0	an a

For 50 head of cattle, 25 acres in the *e* *paddock* and 25 acres in the *late paddock* m suffice.

		£	s.	d.
25 acres @ £2 4s. 1d.	=	55	2	1
25 acres @ £2 14s. 11d.	=	68	14	11
25 acres @ £1 11s. 0d.	=	38	15	0
Total	=	£162	12	0

The cost of supplementary feed per cow = £162 12s. 0d. ÷ 5
= £3 5s. 0d. per he

In most years, dry stock would receive so benefit from the stubble grazing.

On most of the coastal soils, it may be nec sary or at least desirable to use superphosph at the rate of 2 cwt. an acre each year. treat the 50 acres once a year, 5 tons wo be required at approximately £16 a ton lan cost, a total of £80 of £1 12s. 0d. per c So that if superphosphate is used, the cost supplementary feeding becomes £4 17s. 0d. each adult beast on the basis of 50 acres a three crops for 50 head of cattle.

These are standard costs only, calculated some 1959-60 costs. They will serve as a gui On your property, you may be able to produ crops much more cheaply depending on fertility of the soil, its texture, the cost equipment and the allowance you make for wag

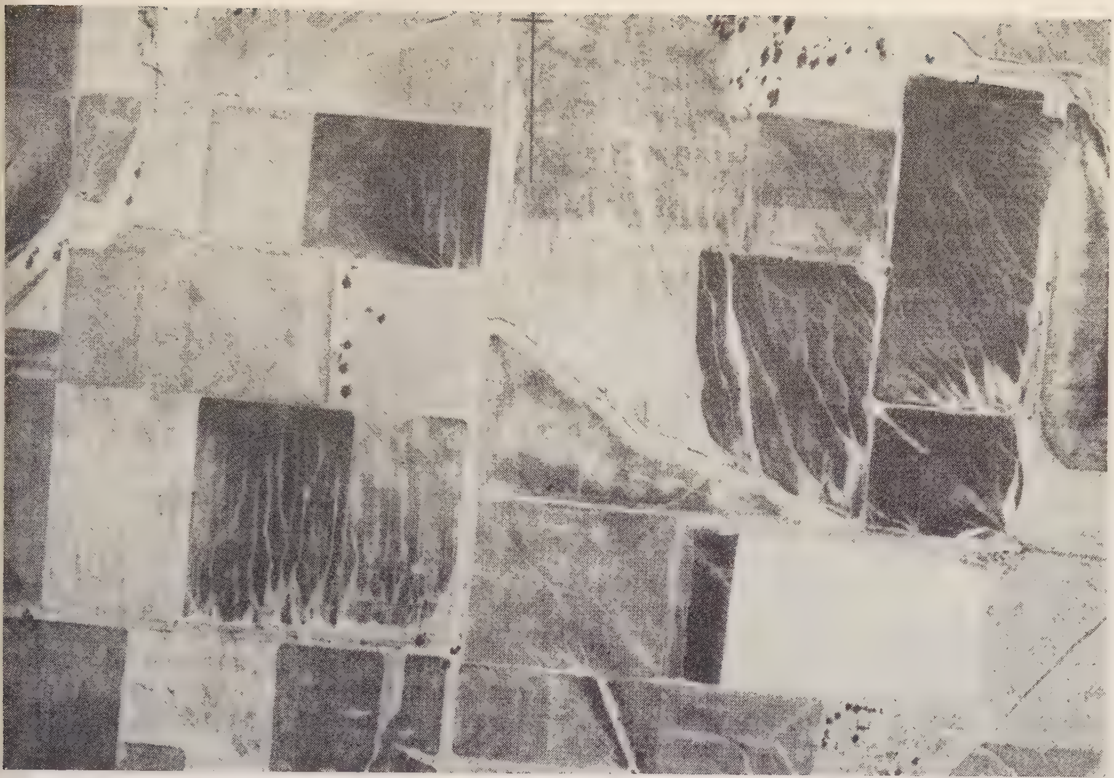

Plate 1: **Serious Erosion on the Eastern Darling Downs.** Problems like these can only be resolved by co-ordinated action.

he Catchment Approach To Soil Conservation

y **J. E. LADEWIG, Chief Soil Conservationist.**

The individual farmer can do much to reduce erosion losses on his property by applying oil conservation measures. This applies particularly to the correction of defective land use. ut the situation frequently exists where a successful outcome depends on a joint attack on the ommunity problem through the simultaneous and co-operative action of groups of adjoining armers whose properties are situated within a common drainage area or catchment.

A torrent of run-off water moving down the ope does not respect property boundaries or ads. In areas which are farmed intensively, il erosion on a property may be as much the sult of run-off water flow from other farms from flow accumulating on the farm itself.

There is an increasing recognition of this fact and farmers in the Darling Downs, Burnett and Atherton areas are joining in group schemes to deal with their erosion problems. In these districts integrated water disposal systems aggregating hundreds of miles have been constructed by landholders in over 30 catchments.

Departmental officers now prepare soil conservation plans on a group basis because they recognise that catchment boundaries delineate the immediate spheres of community interest with respect to erosion problems. Authorities responsible for public utilities such as roads and railways are also aware of the importance of providing the cross-drainage structures necessary for the co-ordinated disposal of run-off water from catchment areas in which soil conservation schemes are being implemented.

Before Settlement

In order to appreciate the desirability of catchment soil conservation schemes, we must look at the situation back in the days before settlement; before man erected buildings, roads and railways, felled the scrub and established pastures; before he brought animals on to the land and started to burn his pastures to provide a green pick for them; long before he started to cultivate extensive areas with high speed machinery, and developed the habit of burning his crop residues. At this time, and it was only a little over a century ago, dense vine scrub or native grasses covered most of the hills and the valleys down to the banks of the rivers and the creeks.

The vegetation absorbed the impact of falling rain, slowed the movement of water down the hill and held the soil together. Soils were rich in organic matter and the slow-moving water was readily absorbed into the friable virgin soil.

Streams ran clear for the most part and without the sediment we now find choking them.

Only the heavier rains caused flooding but a lesser proportion of the rainfall reached the streams and they were able to carry greater flows of water than is the case at present. Flooding was not so widespread as if the same storm came along now. The run-off which made the flood, started at the crest of the catchments and gradually increased in volume as it moved downslope following the fall of the land. There were no roads, fences or crops to impede it or divert it and the water carried very little silt.

Land Development

Since settlement, many things have changed because of the need for increased productivity but the run-off flow still follows the basic natural laws. Reduction of the soil's protective cover and a lessening in its inherent stability created more and faster run-off. Unwise culti tion has left vulnerable areas of cultivation the path of the increased run-off water.

This water has become a potent weapon destruction which carves gullies in its efforts find its way back to its natural path of tra

It may be diverted temporarily by ro fences or crops but sooner or later it will ret to its natural flow line.

The Solution

Soil conservation measures aim to gain con of run-off water before it assumes destruct proportions.

Commonsense farming practices can rest the natural balance and ensure improved abso tion of rain. The systematic collection of run- over the entire catchment and its orderly dispo from the moment it commences to accumulate the practical way of dealing with it. But thi only possible where all members of the cat ment community are prepared to apply th respective sections of the programmes.

The catchment approach, therefore, provi a basis for the systematic planning and imp mentation of soil conservation measures. It many desirable features:

(1) It enables technical officers to prep co-ordinated plans for lands withi catchment area. It facilitates integration of water disposal syste and also enables provision to be ma for co-operative action by lo authorities and Government depa ments.

(2) Landholders are able to visualize only the plan for development a protection of their own farm but a its place in, and contribution towar the whole scheme.

(3) Construction work is facilitated a costs reduced because of a reducti in contractors' travelling time. T opportunity is also presented to se finance on a group basis for implementation of programmes.

(4) Problems in integration can be resolv at meetings of the interested farme

Plate 2

A Typical Soil Conservation Scene on the Darling Downs. Effective erosion control has resulted from joint action on two adjoining farms.

South Burnett, Darling Downs and Atherton farmers have provided a lead in this regard by establishing catchment committees which assist in the resolution of difficult problems.

How a Group Plan Commences

Where a request is received for the planning of soil conservation works on any property it is the practice to consider the needs of adjacent properties and the associated common drainage area. This may include another two or more farms and in some cases as many as 20 properties may be involved. It is usually not long before the other farmers take an active interest and proceed to implement their portion of the plan.

As staff permits, an attempt will be made to plan catchments in advance of actual requests from farmers for the provision of technical services. This has the effect of stimulating interest and it is not unusual to find at least 50 per cent. of the farmers in such catchments who wish to immediately implement the first stages of a programme.

Advance planning also ensures the complete co-ordination of plans before any drainage work commences, and facilitates the solution of the water disposal problems confronting road and other authorities. Planning is currently proceeding on more than 30 catchments with an aggregate area of 160,000 acres.

Co-ordination Committees

Co-ordination of plans has also been assisted by the establishment of District Soil Conservation Committees in the Darling Downs, South

Plate 3

A Stable Waterway Protected by a Cover of African Star Grass. This is one of a network of 30 miles of waterways constructed on the Bones Knob-Mapee catchments at Atherton.

Burnett and Atherton districts. These committees comprise representatives from interested Government departments and from local authorities and their purpose is to resolve planning problems and to ensure the co-ordination of water disposal systems.

The American Precedent

The United States of America has provided the lead in catchment work. Programmes there are well established and by early 1957 work was proceeding on 35 watersheds or catchments aggregating 2 million acres. A further 246 watershed areas were in course of being planned. A feature of these programmes is the insistence by the Government that the first moves for a catchment project must be made by the local sponsoring agencies, and the control of the wo
remains with the local organisation.

How to Stimulate Programmes

Catchment work is here to stay because it pr
vides the opportunity for people to work togeth
for the better co-ordination of soil conservatio
and associated activities. It not only facilitate
co-operative action by groups of farmers an
other agencies in resolving their common prob
lems of water disposal but also enables a join
examination of other problems in land utilisatio

If you wish to sponsor catchment soil con
servation activity in your community have a ch
with your neighbours and then approach you
nearest soil conservation officer.

* * *

STOCK FOODS.—Make sure the stock foods you buy are recognised brands which are correctly marked and labelled.

Whether you are interested in prepared mashes or pellets for your poultry, manufactured meals for your pigs, calves or dairy cows, cubes or nut rations for your sheep, or meals for your stoc
generally, these products are required by law t
be correctly marked and to carry labels setting ou
constituents and chemical analyses so that the
worth may be assessed at a glance. Also include
in this group are additives such as antibiotic
trace elements and vitamin supplements.

Scours Stopped When Movable Farrowing Pens Were Used

By C. PORTER, Senior Adviser, Pig Branch.

In some piggeries, one reason for small litters of undersized weaners is scours. In fact, this problem occurs so often that any reasonable means of curing the trouble would be worth considering even if it included some extra labour.

Mr. E. Black, of Coolabunia, in the Kingaroy district, had this problem and was fully aware that his piggery profits were less than they should have been. He found that the trouble was not caused by bad feeding but by germs picked up from contaminated soil in his farrowing pen yards, so he built two movable farrowing pens for a test.

He now has six of these pens and has not had any sign of scours in suckers since he started to use them. Timber is now on hand for building two more pens.

The pens are by no means elaborate as they do not have floors. However, Mr. Black is fortunate in having a good sward of kikuyu for it was found that this grass made a warm, comfortable bed.

The pens are approximately 16 ft. long by 9 ft. wide, with the iron roof 5 ft. high. Variations in size have been tried but this seems

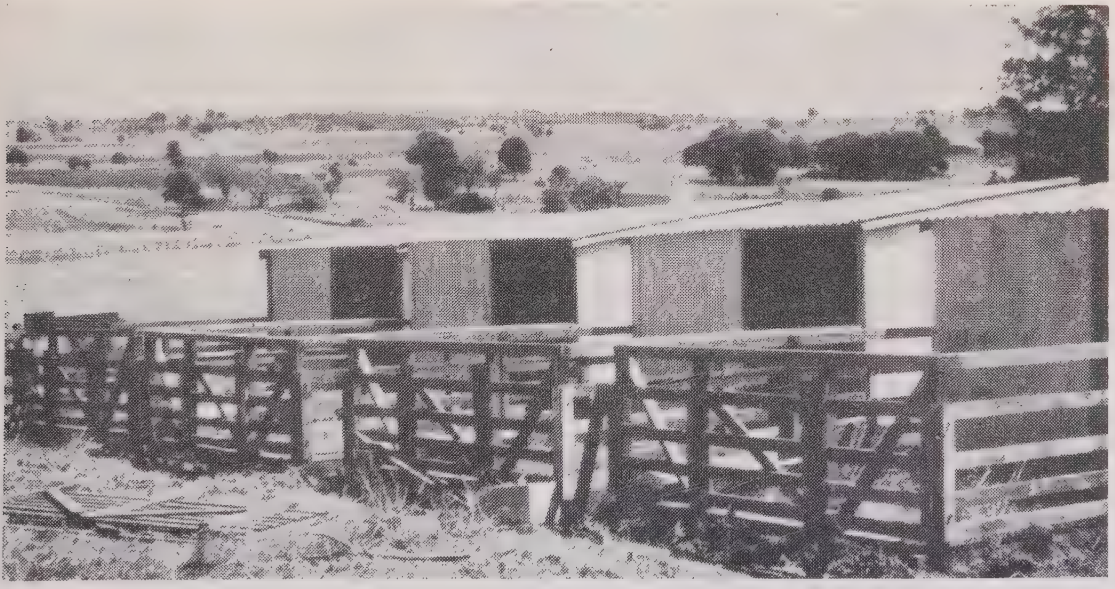

Plate 1

Four of the Six Movable Farrowing Pens on Mr. E. Black's Piggery at Coolabunia, in the Kingaroy District.

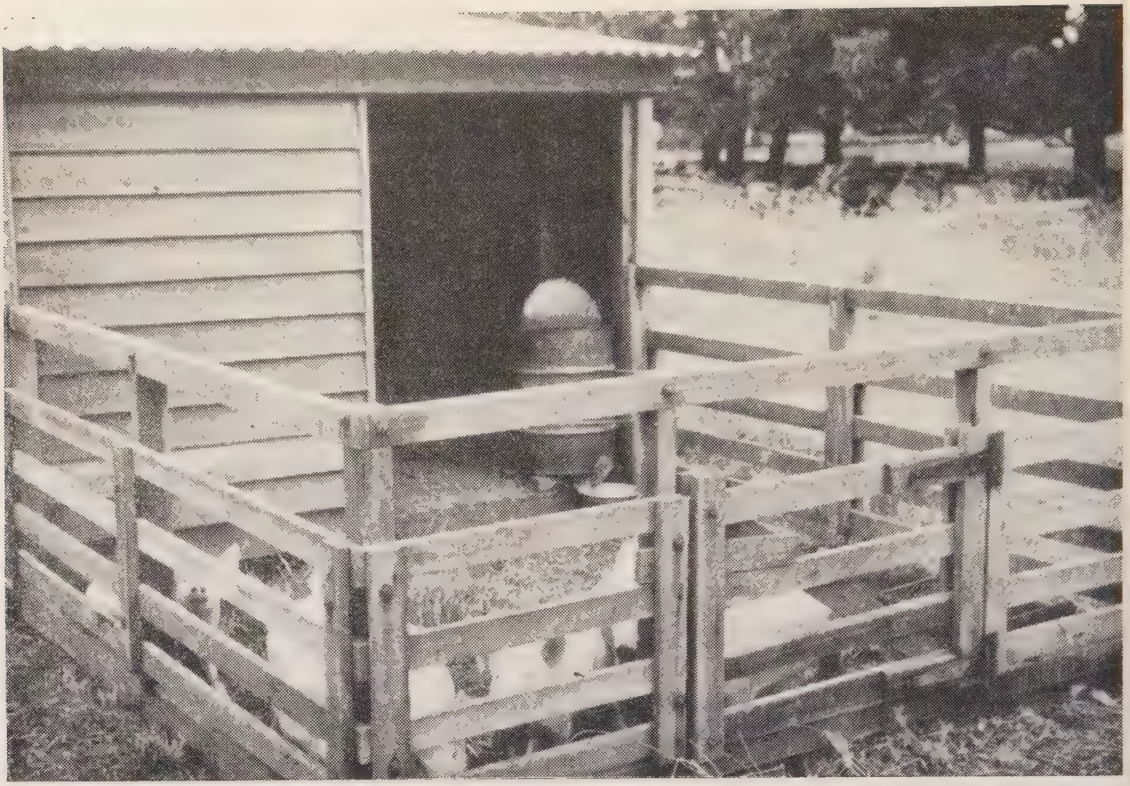

Plate 2

A Close-up of One of the Movable Farrowing Pens Which are Credited with the Avoidance of Scours in Sucking Pigs.

very suitable. Longer pens are inclined to bend when being moved.

The cost of materials for each pen was as folows: Timber £12 10s.; 7 sheets of 8-ft. iron £5 15s.; nuts, bolts an nails £2; a 6-ft. metal trough £3 5s.; giving a reasonable total of £23 10s. excluding labour. Four of the six pens have automatic waterers of the float type at an extra cost of £4 10s. per pen. These have proved so satisfactory that waterers will be attached to the others as soon as possible.

Mr. Black's method of providing water to these pens is to fit a 44-gal. drum with an outlet tap as near the bottom as possible. This drum is placed on an ordinary farm slide. Garden hose runs from the tap to a T piece attached to the first waterer. More hose, connected to the other end of the T piece, gravitates water onto the second pen and so on. Provided the slide is on a slope above the pens, the wat gravitates in sufficient quantities to provide t sow and suckers with all they need.

Water storage could be increased by joinin two drums together with a flexible coupling.

Another method, used by two farmers in th Cloyna district, is also satisfactory. The pen in these cases, have wooden floors under th roofed section. Automatic waterers are attache to 12-gal. drums placed on the outside edge o the floor and secured to one wall by two meta bands or heavy wire tightly twitched.

For and Against

Now this system of housing sows just befor and after farrowing has both advantages an disadvantages. Here are some of the advantages

The movable pens can be faced to suit th weather.

Being confined to the pen, suckers will be easily caught for castration and ear marking if the sows are quiet.

If any sows are touchy, a hurdle (the width of the pens) will afford protection for the man and make a smaller space for the suckers to move about in.

The absence of scours is a definite advantage.

Initial cost of the pens will be lower than concrete floored pens.

Now for the disadvantages:

To get the best results the pens must be moved at intervals depending on the pasture and weather conditions. This means that sometimes the tractor will have to be started up for this job only.

Occasionally the pens will be a fair distance from the main piggery or feed shed, so there will be extra walking at feeding times.

The drums on the slide will have to be refilled periodically or water carted to the 12-gal. drums in the pens.

It is up to you to decide whether increased profits from good weaners will offset the bit of extra time spent in managing the movable pens.

A couple of extra points to give you a clear view of the whole picture: Troughs can be secured to the side of the pen by a simple method that will cut out having to pick them up when moving, yet allow them to be tipped over should rain fill them. Mr. Black weans from movable pens to concrete finishing pens. The pigs remain in these pens till the last 2 to 3 weeks when they have access to a kikuyu run.

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McCamley, E. W. G., "Eulogie Park", Dululu
Wilson & McDouall, Calliope Station. Calliope

Poll Shorthorn

Leonard, W. & Sons, Welltown, Goondiwindi
Yamburgan Pastoral Company, Noondoo

These Drugs Pose Problems In Chickens

By **P. D. RANBY**, Veterinary Officer.

A new approach to the use of coccidiosis-preventing drugs is suggested.

Coccidiosis-preventing drugs, or coccidiostats as they are called, are being widely used for rearing chickens on the ground. Supplied continuously, these drugs act by hindering the development of the coccidia in the intestine of the chicken. With the advent of the newer coccidiostats, it was even thought that coccidiosis was at last "beaten", but it has since been found that they are not a complete answer to the coccidiosis problem. Special problems have arisen, both in table chickens (broilers) and chickens to be reared and kept as adult fowls.

The problem in table chickens was discussed in a previous article: "New Drugs Aid Rearing of Table Chickens" (August, 1960). The problem in chickens to be reared to maturity for egg production and breeding is rather different from that in table chickens.

In the case of chickens to be reared to maturity, the coccidiostat used should be suited to the husbandry methods employed, or alternatively, husbandry methods changed to suit the drug used. The production of immunity against coccidiosis is important in these chickens but not in table chickens. Too often these drugs are not used correctly. In particular, the newer coccidiostats can work for you or against you.

Infection with Coccidia

Coccidia are minute parasites which undergo a complicated life-cycle in the intestine of the chicken. These organisms survive on the ground or in the litter in the form of minute, egg-shaped oocysts (see Plate 1). Following

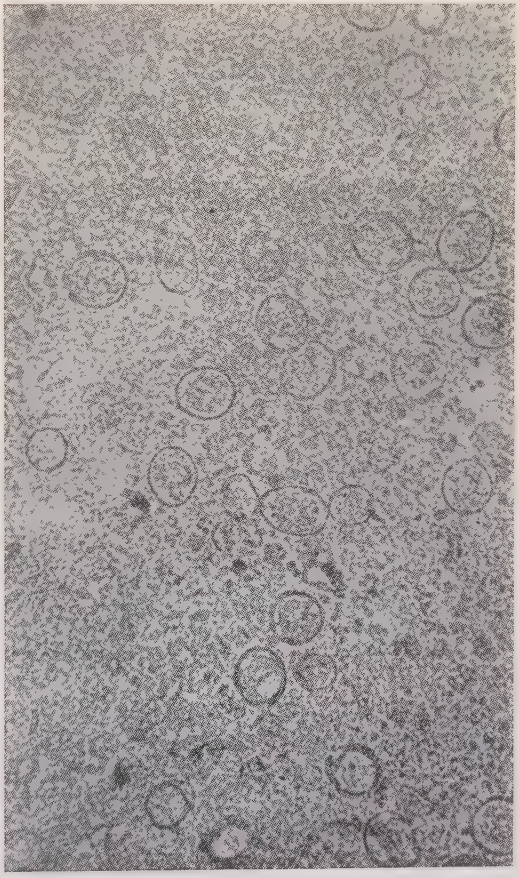


Plate 1

Coccidial Oocysts in Intestine of a Chicken.
(Microscoped approximately 400 times.)

ingestion by a chicken, one oocyst reproduces several hundred thousand or so, depending on the species of coccidia involved. The coccidial cycle is completed in one week and so a rapid build-up of oocysts can occur.

All ground-reared chickens become exposed to coccidia sooner or later. However, if only small numbers of coccidial oocysts are ingested by chickens (up to 1,000 oocysts per day by each chick), immunity will develop without coccidiosis occurring. An attack of coccidiosis results when large numbers of oocysts are ingested by the birds in a short time. Under field conditions, it is usually difficult to regulate the intake of oocysts by the chickens. Outbreaks of coccidiosis may occur under most systems of management in Queensland. Hence the need for coccidiostats.

There are several forms of coccidiosis, depending on the species of coccidia involved. The main forms are caecal coccidiosis due to *Eimeria tenella* (see Plates 2 and 3), intestinal coccidiosis due to *Eimeria necatrix* and duodenal coccidiosis due to *Eimeria acervulina*. Other species also exist but do not produce disease under ordinary conditions.

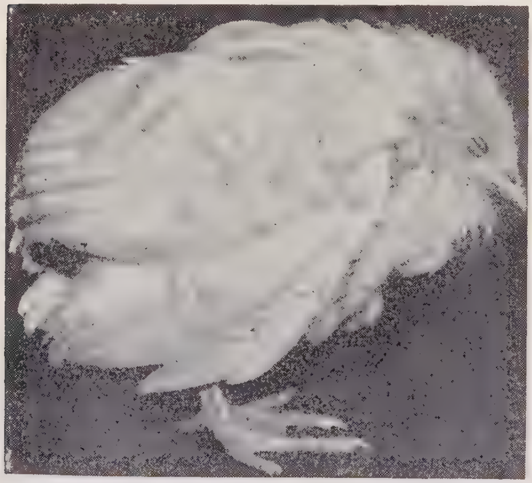


Plate 2

This Chicken is Affected by Caecal Coccidiosis Due to Eimeria tenella. Note the severe depression and drooping of wings which is typical of this disease.

Immunity Essential in Pullets

Where coccidiostats are used, it is essenti that the chickens develop immunity durin preventive treatment with drugs, because the drugs can be given for only a limited period. a particular drug is too effective in blockin coccidial development, immunity may fail occur. The birds are then exposed to coccidios when treatment ceases. Later, we will rela immunity development to the coccidiostat use and the husbandry methods employed.

Immunity depends mainly on the later stage of the parasite in the intestine of the chick There is no cross-immunity between the variou species of coccidia.

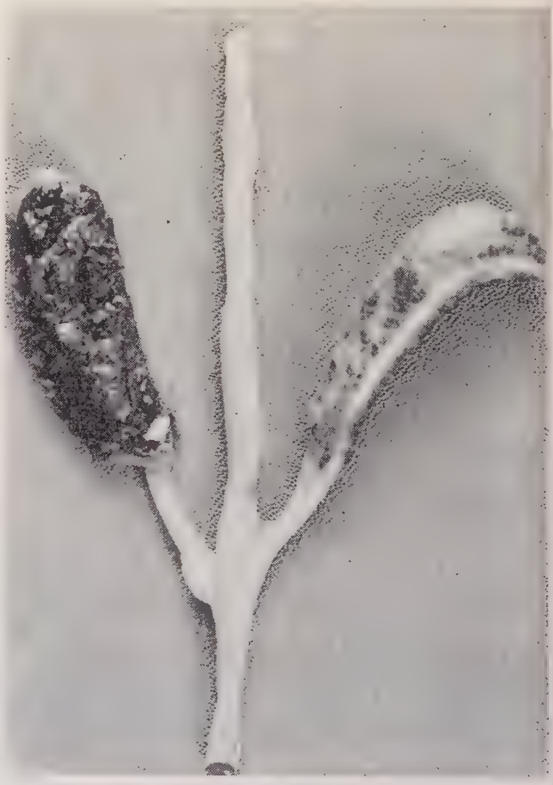


Plate 3

The Caeca (or Blind Pouches) from a Chicken Affected by Caecal Coccidiosis. The left caecum has been slit open and shows severe bleeding and blood clots. The right caecum is distended with blood.

rugs Used

The following coccidiostats are used in ueensland:

) *Nitrofurazone*

Nitrofurazone has been used here for over hree years for controlling coccidiosis. Although his drug is sometimes used for treating outbreaks, its main value is as a preventive. Results n the field here have been variable. The occidia may "break through" this drug where heavy build-up of oocysts has occurred. Nitrofurazone does not seem to interfere with mmunity development at the levels used 0·01 per cent. in the mash). It is supplied n mash or drinking water.

Recently nitrofurazone has appeared on the market combined with furazolidone to which it s related chemically.

ii) *Nicarbazine*

Nicarbazine has been available here for a little over two years. Supplied in mash or medicated crumbles (at a level of 0·0125 per cent.), the drug is highly effective in preventing coccidiosis but is of no value once outbreaks occur. It is not supplied in water. There is field evidence hat nicarbazine sometimes blocks the development of immunity. The drug is cheaper than he other coccidiostats.

(iii) *Zoalene*

Zoalene is the most recent coccidiostat, appearing here late in 1959. Like nicarbazine, zoalene s highly effective as a preventive but has the additional value that it is also very effective (at a higher dose) for treating outbreaks. It is supplied in mash at the rate of 0·01 per cent.

(iv) *The Sulphonomides*

The sulphonomide drugs are used only occasionally as preventives but are commonly used for treating outbreaks. At low levels in he mash, these drugs are moderately effective but tend to produce undesirable side-effects after prolonged administration.

The drug arsenosobenzene recently used xperimentally overseas with some success may not be marketed as it has no advantages over drugs already in use.

Preventive Treatment

Coccidiostats are supplied continuously in the mash (or sometimes in the drinking water) to chickens until they are about half grown (10 to 12 weeks old). Sometimes drugs are continued longer but the period of treatment is limited by (*a*) cost (in the case of nitrofurazone and zoalene), and (*b*) deleterious effects on egg quality (in the case of nicarbazine supplied to laying fowls).

How Breakdowns Occur

In the case of chickens, drug breakdowns are of two types:

(1) Coccidiosis during treatment.

(2) Coccidiosis soon after treatment ceases.

Outbreaks During Treatment

Outbreaks of coccidiosis during treatment with drugs would indicate that the particular coccidiostat used is not sufficiently active to control the heavy exposures of oocysts. Drugs such as nitrofurazone and low level sulphonamides come into this category. However, if outbreaks can be reduced in frequency and kept to mild proportions by these drugs, they may still be of value if followed by drugs suitable for treatment (sulphonamides, zoalene) when required.

Outbreaks during treatment with the more active coccidiostats (nicarbazine and zoalene) are rare. Where such outbreaks occur, one may find that hygiene is usually very poor or the birds are not receiving sufficient of the drug as a result of improper mixing in the mash or due to impaired appetite.

Outbreaks After Treatment

Outbreaks of coccidiosis occurring a few weeks after treatment would indicate that immunity to coccidiosis failed to develop while the drug was being administered. This situation sometimes arises with the newer drugs, nicarbazine and zoalene. Whether immunity develops or not during treatment with these drugs will depend on the degree of exposure of the chickens to coccidial oocysts. If the initial exposure or contamination of the litter with oocysts is small, nicarbazine and zoalene may prevent any appreciable increase in oocyst numbers.

Since outbreaks following the withdrawal of the drug will involve older chickens, they will be much more serious. Usually, but not always, it is the intestinal form of coccidiosis that has appeared under these conditions in Queensland. Some of these outbreaks have been particularly severe. The following five cases have come to notice:

Case 1

In October, 1959, a severe form of intestinal coccidiosis (*Eimeria necatrix*) appeared in 900 cross-bred pullets, 19 weeks old. Eighty birds became sick and died in three days. Only for zoalene treatment, which quickly halted the outbreak, it is expected that losses would have been much heavier.

These pullets had been brooded in a very clean environment on a wooden floor with fresh woodshavings and later transferred to laying sheds which were also cleaned out beforehand. For the first 15 weeks of life, the birds had been given nicarbazine in the mash at the recommended level.

Case 2

On the same farm as case 1, 300 cross-bred pullets developed caecal coccidiosis when 15 weeks old. These birds were reared similarly in a clean environment and were given nicarbazine in the mash for the first 12 weeks of life.

The outbreak appeared three weeks after the drug was withdrawn and affected about 20 per cent. of the birds in a short time. Zoalene treatment at high level for 4 days halted the attack but birds started to pass bloody droppings again on the fourth day after treatment. Retreatment (for 11 days) again controlled the outbreak and no further cases occurred.

Case 3

At a farm close to Brisbane, intestinal coccidiosis appeared in 600 pullets on the point of lay in January, 1960. These birds were housed in a number of small pens each containing 20 birds on concrete floors and fresh litter. The pullets had been supplied zoalene as a coccidiostat for the first 18 weeks of life. The first cases appeared four weeks later and involved all pens within several days. Zoalene treatment soon halted the outbreak but overall losses were about 5 per cent.

Case 4

At Kairi, on the Atherton Tableland, a sev attack of intestinal coccidiosis affected a fl of 400 pullets which had been laying for c three months. These had been supp nicarbazine in the mash for the first 16 we of life and had been housed intensively in thoroughly clean environment using conc floors. The disease appeared some 18 we after drug treatment. Treatment with sulpho mide drugs produced a response but many the birds suffered a setback and some 60 dea occurred (15 per cent.).

Case 5

At Zillmere, in January, 1960, severe intesti coccidiosis started in 800 pullets 12 and weeks old, one week after being placed on o built-up litter in intensive laying pens. T birds had been reared in colony houses with w floors but ranged out during the day. The bi had been supplied zoalene continuously fro day old, treatment ceasing when they were tran ferred.

Altogether 150 pullets died, despite treatme with sulphonamide drugs.

Coccidiostats Adapted to Husbandry

Coccidiostats should not be used haphazardl There is a definite relationship between coccidi stat, immunity and husbandry methods employe This involves a completely new approach to t use of coccidiostats.

There should be two aims in view when usi these drugs—

(1) To ensure the development of immuni during treatment.

(2) To prevent or considerably reduc coccidiosis outbreaks.

To some extent, these two aims are oppose to one another. Thus, if a particular drug i highly effective in blocking coccidial develop ment in the intestine, immunity development ma be poor or absent. Again, if immunity is ensure by a less active drug, there may be some dange of coccidiosis. This problem may be overcom by gauging the degree of exposure to oocysts in the litter, or alternatively, choosing a coccidiosta suit the degree of exposure to oocysts. The ect of environment is as follows:

) The Clean Environment

By "clean environment" we mean that the ound or litter contains relatively few oocysts. me poultry farmers even disinfect the concrete oor before placing fresh litter down in preparing e pen to receive chickens. On most poultry rms, such an environment only delays the uild-up of coccidia to a time when the chickens e older. Rapid build-ups may then occur at later date. It is possible to slow down such rapid build-up by means of litter management. occidial oocysts do not survive long if the litter kept very dry. Exposure can be further educed by periodic stirring of the litter to dis- erse or "dilute" the oocysts on the surface of e litter. But in practice, most examples of tter are not dry enough to hinder oocysts.

If highly effective coccidiostats such as icarbazine and zoalene are used in conjunction ith a clean environment, one can expect that nmunity to coccidia species will fail to develop. he initial clean environment would explain the ccurrence of coccidial outbreaks after preventive reatment with these drugs has stopped.

If less active coccidiostats such as nitro- urazone or a combination of this drug with urazolidone are supplied to chickens maintained n a clean environment, there will be a reason- ble chance of some coccidial multiplication and ence the development of immunity.

2) *The Contaminated Environment*

By contaminated environment we mean that he ground or litter contains a larger number of ocysts. Chickens placed in such an environ- nent will become infected immediately. If the hickens are day-olds the rate of ingestion of ocysts will not be so heavy as in chickens rought down at say, four or five weeks old, rom battery brooders since the latter eat elatively more litter. Such an environment is isky where chickens brooded in batteries are rought to the ground.

If highly effective drugs are supplied in this nvironment, there will be a reasonable chance f immunity against coccidiosis developing uring the period of drug treatment at the preventive level. If less active coccidiostats are used, there is a danger that the coccidia may break through the drug barrier, particularly if the exposure to oocysts is heavy.

These Rules Suggested

1. If you prefer a clean environment containing a minimum number of oocysts, it may be preferable to use one of the less active coccidiostats such as nitrofurazone (with or without addition of furazolidone). Husbandry methods should aim at reducing or slowing down any coccidial build-up by keeping the litter dry and using a reasonable depth of litter (6 to 8 in.). The litter should be stirred at least once a week. A suitable drug such as zoalene or one of the sulphonamide drugs (sodium sulphamerazine or sodium sulphaquinoxaline) should be kept on hand to treat coccidiosis in case the disease appears.

2. If the environment used is relatively contaminated with oocysts one of the more active coccidiostats (nicarbazine, zoalene) should be used.

3. An alternate and somewhat intermediate method is suggested on theoretical grounds as follows:

Ensure early infection with oocysts by leaving a trace of the old litter when replacing it with fresh litter (about 1 lb. or old litter should be sufficient for 500 birds). Avoid using disinfectants as these only delay the appearance of oocysts. This slight contamination with coccidia will act as an "inoculum".

Use an effective coccidiostat intermittently, alternating 2 weeks of treatment with one week of no treatment. Thus, over a 12-week period, the birds are exposed to coccidia for three 1-week periods. A further modification of this scheme would be to start the drug when the chickens are 1 or 2 weeks old instead of from day-old. Zoalene may be thus be supplied intermittently in the drinking water for convenience. Where continuous drinking systems are used, however, it will be necessary to supply zoalene or nicarbazine intermittently in the mash. If a medicated mash (or crumbles) is used, be sure to use labels to distinguish it from the unmedicated mash.

These Points May Require Caution:

(i) *Absence of Some Coccidial Species*

In order to be fully effective, the "inoculum" used for immunizing the chickens must contain the three important coccidial species. If one or more species is absent, failure to develop immunity against these would result.

In general, *Eimeria tenella* (caecal coccidiosis) is associated with younger chickens (for example 1 month old) while *Eimeria necatrix* (intestinal coccidiosis) and *Eimeria acervulina* (duodenal coccidiosis) are associated more often with older chickens (for example 2 months old). This association would apply to chickens kept under reasonably hygienic conditions. Thus, if litter from young chickens is used as an inoculum, the chances are that *Eimeria tenella* may be present but the other two species (*E. necatrix* and *E. acervulina*) may be absent.

To overcome this problem, prepare the inoculum from litter used by chickens about 2 months old rather than 1 month old.

(ii) *Presence of Roundworm Eggs*

The number of roundworm eggs present in the inoculum would be relatively few providing the litter has not been used continuously between batches of chickens. In any case, the chickens should be de-wormed when half grown (about nine weeks old).

(iii) *Presence of Leucosis Virus*

One could suggest the contamination of used litter with leucosis virus. However, the contamination should be small because (*a*) faeces or droppings are not a potent source of virus and (*b*) the volume of the inoculum is only a fraction of the total volume of litter when fresh litter is added.

In any case, leucosis virus could be readily destroyed by the following method:—

Wet the sample or litter to be used as the inoculum using an alkaline solution. Such a solution may be prepared by adding 1 teasp
of washing soda to half a pint of water. T
spread the litter sample out for 24 hours
partially dry. Mix with an equal quantity
fresh litter (that is about 1 lb.) and sprin
over the litter of the pen. The alkaline ef
destroys virus but not coccidia or worm eggs.

Value

The probable value of an inoculum of cocci
during medication may be shown in the follow
case:—

A poultry farmer near Brisbane rea
chickens to near the laying stage in efficient wi
floored colony cages. Owing to inability to eq
his farm with laying cages, the pullets w
brought to the ground late in 1959. The bi
were placed in clean disinfected intensive pe
with concrete floors and fresh litter, each p
holding 100 pullets. Zoalene at the prevent
level was supplied to each flock for four wee
continuously in the drinking water. Intesti
coccidiosis appeared regularly in each group
to 14 days after cessation of treatment but w
readily controlled by treatment with zoalene (f
days high level followed by seven days h
level) in the drinking water. It was decided
change the method of pen cleaning in four pe
by omitting the disinfection with Lysol a
leaving a trace of litter behind when adding t
new litter. Of the 15 groups thus brought
the ground and treated at the preventive lev
for four weeks, the four "contaminated" pe
were the only ones which did not develo
coccidiosis after withdrawing the drug.

Further observations on these methods usin
the newer coccidiostats are required to asse
their value in practice. It is not expected tha
these methods will always be fool-proof but
they can reduce the coccidiosis problem to
minimum, they will be well worthwhile.

Cowpeas In A Cropping System For The Coastal Burnett

By N. F. FOX, Agrostologist.

Cowpea crops have long been used for improving soil fertility and this applies very well in the Burnett coastal districts. Each year there is fresh evidence of increased yields from the crops and sown pastures that follow cowpeas.

Cowpeas will grow on the poorer soils usually considered unsuitable for agriculture. They are legumes which add nitrogen to the soil. Grazed cowpea crops have improved soil structure, added organic matter, and improved the texture and moisture holding capacity of the lighter soils.

They are heat tolerant and resistant to drought conditions. They provide excellent high quality feed during the summer and autumn months. More important is the fact that they cover the soil during periods of high intensity rains and so protect it from the disastrous effects of erosion.

On the poorer coastal soils and on the sandy soils of the Eidsvold district, cowpeas have responded to applications of 2 cwt. of molybdenised superphosphate to the acre. Fertilizer has resulted in increased yields of cowpea and better following crops.

Varieties.—Poona is the most popular variety, although susceptible to stem rot. Reeves and Cristaudo are commonly planted. New stem rot resistant varieties such as Malabar are now in limited production.

When to Plant.—Plant on the first storm rains in the Spring—September or October—for December to February grazing. This is the early crop. The land may be worked again for planting to oats in March or April.

Plant cowpeas in late December or early January for April to June grazing.

For the early planting, drill in a mixture of 10 to 15 lb. of cowpea and 6 lb. of white panicum to the acre.

For the late planting in midsummer, change the mixture to 10 to 15 lb. of cowpea and 8 lb. of sweet sudan grass. Sudan grass will tend to make some regrowth in the cooler months and in the following spring.

Inoculate the cowpea seed to ensure that the most efficient nitrogen fixing bacteria are present in the roots. The nearest source of inoculum supply is the office of the Department at Bundaberg.

Land Preparation.—On new land, burn the native grasses in July and, using a chisel plough or other tined implement, work the land until native species have been destroyed. This type of implement ensures that as much organic matter as possible is retained on the surface and the land is left in a condition to absorb storm rains with a minimum of run-off.

Usually three workings will be required. Apply superphosphate at the last working so that fertilizer will be incorporated in the top soil prior to planting.

Plate 1

A Well-Grown Crop of Panicum and Poona Cowpea that is Ready for Grazing.

Plant immediately following the first good storm rains. A seed box mounted on a chisel plough gives satisfactory results.

Grazing Practice.—Graze at the rate of about 2 beasts to the acre. The early crop grazed during December and January will lift cream yields or pack the beef on bullocks.

The late crop provides excellent supplementary grazing during April, May and June. It will produce continued weight gains when native pastures are deteriorating and stock condition is starting to drop. It can be grazed until the oat crops are ready.

Preparation for Following Crops

Plant pastures or oats following the early crops. In January, plant pasture mixtures into the lightly cultivated surface soil. Again using the chisel plough, lightly work the grazed stubble, dropping seed at the same time, so that th pasture mixture is barely covered with a mixtur of surface soil and trash.

The following wet season rains should ensur satisfactory establishment, while the cowpea white panicum crop stubble will prevent the soil from crusting and reduce soil temperatures durin January-February heat waves. The chisel ploug working will fracture the surface soils sufficientl and permit maximum penetration during the earl stages of the summer rains.

If oats is to follow the early crop, continue ligh grazing until the end of February, then plant oats using the same method as for pasture, excep that two workings may be necessary.

If good rains fall in June or July, the late planted summer crops may be followed by barley for spring grazing. If not, use the stubble during the spring months.

TABLE 1

FODDER CROP GRAZING SYSTEM FOR 50 HEAD OF ADULT CATTLE

50 acres	
Early Paddock—25 acres	*Late Paddock—25 acres*
Sept.–Oct.—Plant cowpeas and white panicum	Dec.–Jan.—Plant cowpeas and sweet sudan
Dec.–Feb.—Graze	April, May, June—Graze
March–April—Plant oats	June–July—If good rains fall, plant barley If rains poor, graze sudan grass stubble in the spring
June–Sept.—Graze	
Repeat or	
Sept.–Oct.—Plant cowpeas and white panicum	
Jan.—Plant pasture	*Repeat*

A Cropping System

Grazing crops should produce high quality feed in those periods of the year when native pastures are of low nutritive value. Adopt the philosophy that fodder crops and sown pastures are supplements to the native pastures. Native pastures deteriorate rapidly after the end of March. Even in good years, native pastures may be checked by December-January heat and dry conditions.

A two paddock system will provide fodder during the periods December and January, April May and June, July August and September. Spring regrowth in sown pastures may be used in the September to November periods in conjunction with the green pick in native pastures.

Allow about 1 acre of crop for each adult beast to be fed. As soil fertility improves, higher carrying rates may be possible.

For 50 head of cattle, two 25-acre paddocks are suitable. The system is set out in Table 1.

Plate 2

A Sweet Sudan/Poona Cowpea Mixture that is Ready for Grazing.

Plate 3

A Good Crop of Oats.

Property Improvement.—The system allows for progressive property development. Each year the early paddock could be planted to sown pasture and a new area brought into cultivation. In this way the carrying capacity of the property might be increased gradually while maintaining production per animal unit.

What it Costs.—Clearing costs and fencing will vary from property to property, but on cleared land it can be shown that the standard cost of growing three crops in the two 25-acre paddocks for 50 head of cattle is £3 5s. a head or £4 17s. a head if 2 cwt. of superphosphate is applied to each acre annually.

Many farmers and graziers will be able to produce more cheaply.

* * *

Don't Plant Cotton Too Deep

Planting depth for cotton seed is a vital factor in obtaining a good stand of seedlings.

For germination, seed must be planted in moist soil but don't be tempted to "chase" the moisture beyond 2 in. If the seed germinates below this depth on heavy clay soils, the seedling may not be able to break the surface. Sandy soils are safer from this point of view but the seedlings may be weakened by the time they push above ground. They then have no resistance to dry spells or insect attacks and a poor stand results.

Some growers fit a shallow furrow opener in front of the planting boot to scrape away loose dry soil. This is a good idea but don't make the furrow too deep.

—*W. G. STEELE, Senior Adviser in Agriculture.*

Growing Glycine For Seed In The Lower Burdekin

By W. A. R. COWDRY, Senior Experimentalist.

Climatic conditions in the Burdekin Delta are very favourable for the production of glycine seed.

The combination of summer wet season conditions, necessary for prolific growth of tropical plants, with dry, temperate winter weather required for seed harvesting, occurs nowhere in Queensland except in the area known as the "Dry Tropics." This is an area of coastal lowland which extends from Ingham in the north, south to Bowen, and is bounded on the west by the Dividing Range.

The lower Burdekin part of this district is particularly favoured because of the abundant supply of underground water available at a comparatively shallow depth. Moreover, most farmers in the area are already equipped for irrigating large areas of land, and the country, while slightly undulating, is all irrigable. Soils are well drained.

Time of Planting

Planting can be carried out in either the autumn or the spring months. Seedlings of *Glycine javanica* are slow-growing, especially if planted in April or May, but this period has the advantage of better moisture conditions while the weed growth, although relatively thick, can be controlled. It usually effects a shading which may (in the odd season of lower temperatures) be beneficial.

On the other hand, plantings made in spring may need to be established under irrigation. Early seedling growth should be slightly faster than that of the autumn-sown crops but will have to compete with rather prolific weed growth before becoming properly established. In this case, therefore, preplanting preparation of the seedbed should be of a better standard.

Spacing and Rates of Seeding

If it is desired to plant in 42 in. rows, so that cultivation may be practised in the early stages, the sowing rate should be 2 to 3 lb. to the acre. It can be carried out with a vegetable seeder using planting depths of ½ to 1 in. The surface tilth should be as fine as possible.

Because of the prostrate habit of this plant, soil ridges should be avoided; otherwise some of the crop would be missed in the subsequent mowing. The seed may, therefore, be broadcast or sown in narrow drills, and in this event a sowing rate of 8 to 10 lb. to the acre will be needed.

Establishment

In order to maintain the growth of the seedlings and suppress the growth of grasses and weeds, judicious mowings with the blade set high should be carried out until the seedlings attain 6 in. After that time they will fend for themselves and during late summer will grow and spread quite rapidly.

Seed Treatment

Because the seed develops a hard coat, that which is older than six months should be immersed in boiling water. It should be allowed to cool for 15 min. and then to dry quickly and thoroughly. Seed so treated should be planted as soon afterwards as possible.

Plate 1

Glycine Grown For Seed At the Ayr Regional Experiment Station.

Because this crop is a comparatively new one, it is important to inoculate the planting seed. The correct inoculum is available from the Department of Agriculture and Stock's laboratory in Brisbane, and should be applied to the seed according to the directions included with each bottle.

General Growth

Plantings made in the autumn should be sufficiently advanced to produce a reasonable coverage and mature a seed crop in the winter of the next year. The first seed crop from a spring planting will be relatively light, as it has not had the same time to develop vigorous plants.

It is important to keep the crop growing evenly. The reason for this is that under Lower Burdekin conditions, while flowering might extend over a period of 4 to 5 weeks, all pods in such a crop will mature evenly over a period of a few days. This is a particularly valuable asset, which other tropical legumes such as centro and stylo do n possess to the same degree.

Seed Formation

The flowering period is a particularly vulner able one. This is because any check to growt during this period may interfere greatly with th even rate of maturity. This check may be cause by moisture stress or frosty conditions and i either case will cause premature ripening of thos pods nearing maturity, together with shrivelling o seed.

Some regrowth and flowering, with a secon crop of pods, will then take place, so that tw distinct seed crops will be formed. Under thes circumstances, the decision has to be made t harvest when the highest yield of mature an viable seed can be obtained. This is sometime difficult.

In order to mature the crop over as short period as possible, it is sometimes necessary t

Plate 2
Mowing Glycine Which Carries a Heavy Seed Crop.

curtail the soil moisture supply. In practice it is very difficult to judge just when cessation of watering will give even ripening without serious reduction in yield.

When fully mature, the pods shatter readily, especially if dry weather has prevailed. Time for harvesting is then very limited, because a few hours' delay will result in heavy seed loss.

If large areas are involved it is not advisable to mow larger sections than 2–3 acres in any one day. The harvesting can thus be spread and seed loss by shattering will be minimized. The later seeds at the top of the plant should be fully developed, that is, the shape of each seed must be well-defined on the outside of the pods. By this time the early seeds should have turned from yellow to brown in colour.

Harvesting Methods

Conventional headers may be used for seed harvesting.

Because the plant is prostrate when grown as a crop for seed, it is necessary to harvest the whole of it. This involves passing a considerable quantity of material through the header.

Two methods of harvesting are available. One is direct harvesting, in which the crop should be allowed to wilt and dry out in the field. The seed sample so obtained is often contaminated and has lower viability owing to the need to force the setting of the seed.

The other method involves mowing, allowing the plants to wilt so that the leaves and pods become brittle and then passing the mown swathe through an "all crop" type of header for thrashing and winnowing. It is then a relatively simple matter to clean the resultant seed and produce a final sample that will be of good viability and contain little trash.

Depending on circumstances, the mown material should be ready for thrashing within 4 to 7 days. The dry material can be picked up easily by lowering the knife bar as near as possible to the ground. In this position the reel arms will pass the material on to the canvas if set close to and slightly forward of the knife bar. A high drum speed should be used, and for a 20 in. diameter peg drum the best speed of the cylinder shaft will probably be 900 to 1,170 r.p.m.

Cold Tolerance

Because glycine is a legume of tropical origin, its growth is reduced considerably as soon as temperatures descend below 40 to 45 deg. F. Leaves become yellow at first, then they drop, and growth is stopped when temperatures fall below frost level. The plants are not killed, however, unless exposed and unprotected.

Glycine shows slightly more tolerance to cold than does centro, which is the main pasture legume grown in the tropics. For this reason it maintains a certain amount of cover throughout the winter months, when grown as the legume component of a pasture.

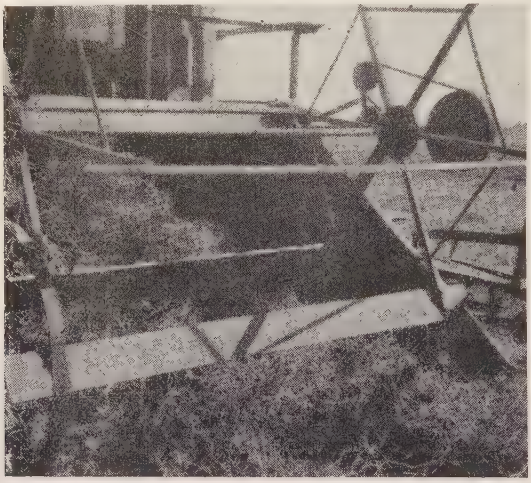


Plate 3

Dried Bulk Passing Up the Canvas of the All-Crop Header for Threshing.

Weed Seed Problems

When growing glycine or any of the tropi legumes for seed, it is important to keep the are free from weeds. Many weed seeds of this ar are of a size approximating one or other of the legumes and it is very difficult, if not actua impossible, to get rid of them by mechani means.

Convolvulus is probably the main weed watch in the Burdekin area.

Seeds of grasses are not so hard to remove, b the presence of grass, besides spoiling the lo of the crop may, if too thick, hamper the effecti harvesting of the crop for seed.

Persistence of Crop.

It is advisable to burn the residue after thras ing, because it has been found that this does n readily disintegrate and causes inconvenien from dust and unsatisfactory harvesting conditio in the following year.

Furthermore, it is imperative that a thoroug irrigation be given the area as soon as possib after the crop is harvested, so that the quic regrowth will reduce the inroads of weeds an grasses in the period before the summer rains.

An area of glycine can be expected to produ up to five crops of seed on the alluvial soils this district, and yields should average 150 lb. the acre. The invasion of grasses, such as Guin and Para will have to be watched, however, an chipped out in later years.

Fowl Manure

Fowl manure is a by-product of the poultry industry and, like most natural manures, is of variable composition. The composition depends on the feed the poultry have been receiving, the amount of moisture present and the degree of contamination of the droppings. The best manure is that collected from under the batteries or perches. Fowl-yard sweepings are diluted with soil and other substances which have little or no manurial value.

Air-dried fowl manure from under batteries or perches contains from 2 to 3 per cent. nitrogen, from 4 to 6 per cent. phosphoric acid and abo 1 per cent. potash. Wet poultry manure woul contain about half these amounts of plan nutrients. Fowl-yard sweepings usually run abo the same as wet manure.

Fresh fowl manure should not be allowed t come in contact with the roots of young plant as it is liable to cause burning. It should b supplemented with potash to make a complet fertilizer but is best used in conjunction wit artificial fertilizers.

From Mat Grass to Lush Clover

By R. E. PHILIPS, Dairy Officer.

The transformation of swampy, coastal mat grass flats into lush clover pastures spells successful management on any farm. Not only does it ensure increased dairy production but it also increases the fertility and capital value of the farm concerned.

On a property in the Beachmere area of the Caboolture district this amazing transformation has been brought about in the short space of 5 years by the owner, Mr. W. Lehmann. These improvements have enabled cow numbers to be increased and extensive subdivision to be introduced to obtain the most favourable feeding value from pastures.

In 1942, Mr. Lehmann purchased a 93-acre mat grass farm near Beachmere. For the next 10 years, market gardening provided the entire income from the farm, but at times returns from this produce fluctuated widely.

It was in 1952 that Mr. Lehmann turned his attention to dairying. Assisted by his wife and his two young daughters, he set about building up a dairy farm.

By 1954 the herd had been increased from the original three cows to 15. However, this stocking rate taxed the carrying capacity of the farm to such an extent that heavy feeding with concentrates had to be undertaken to maintain the condition and production of the herd. It became evident to Mr. Lehmann that under these conditions dairying was not profitable. Some cheaper method of production had to be found.

Pasture Establishment

Mr. Lehmann developed an interest in improved pastures whilst attending several field days in the surrounding district. A firm belief that equally good results could be achieved on his own farm convinced him that improved pastures would overcome his problem. He sought and acted on advice from officers of the Agriculture Branch of the Department.

Two major obstacles prevented immediate adoption of any pasture improvement scheme. Firstly, a large area of the farm consisted of poorly drained swampy marshes. Secondly, an almost pure stand of mat grass covered the entire farm.

As an initial step, effective drainage was achieved by laying out a network of channels which ultimately emptied into a nearby salt water creek. Areas which were once entirely covered by water during the wet season now drain rapidly, even after heavy storms.

In an effort to eliminate the mat grass, ripping of the natural pasture with a hired chisel plough was carried out. Superphosphate was applied at the rate of 3 bags to the acre towards the end of February, 1954. Inoculated clover seed (½ lb. Ladino, ½ lb. New Zealand White and 1 lb. strawberry clover to the acre) was broadcast early in March. A light set of pasture harrows was used to cover the seed. Six acres were treated in this way in 1954, and since then additional areas have been improved each year.

Pasture Management

Mr. Lehmann knew that without a balanced grazing programme the real value of improved pasture growth would be lost, so he subdivided the farm into 35 paddocks, ranging in area from 4 acres to half an acre. This was a vast improvement on the original layout when the farm consisted of only 2 large paddocks. A strict routine of rotational grazing is now practised.

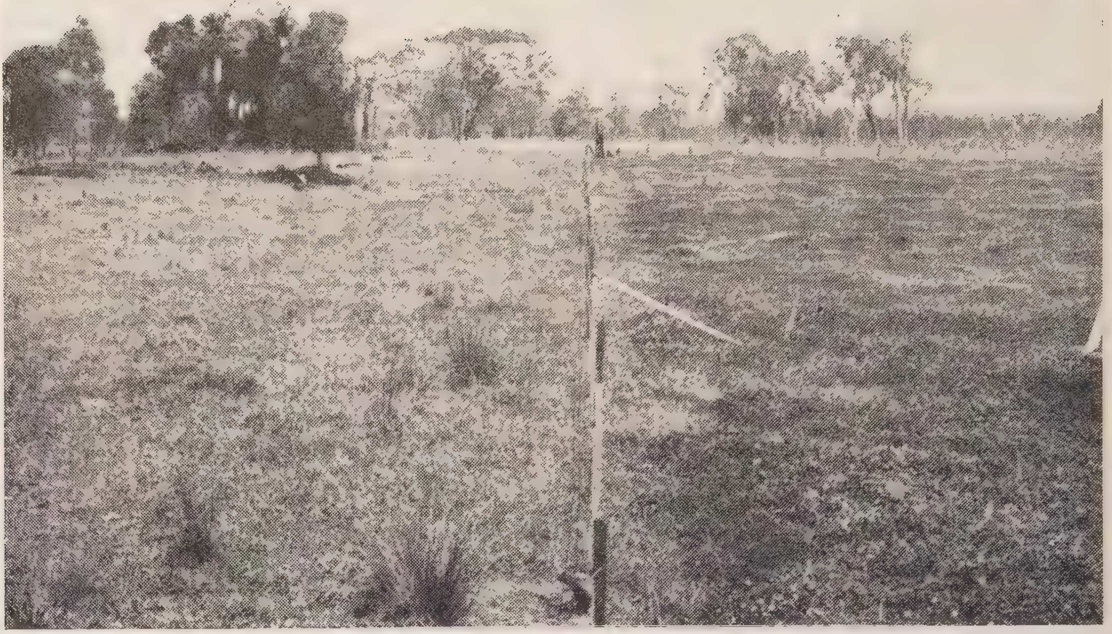


Plate 1

The Dark Area of Clover on the Right of the Fence on Mr. Lehmann's Property Shows how Fertilization of the Soil Brought a Rewarding Response.

The dairy herd is grazed on each paddock for 1 day and then this paddock is spelled for 1 month. It is interesting to note that while the pastures contain a high proportion of clover, Mr. Lehmann, by careful management and controlled grazing times, has almost eliminated the problem of bloat in his herd.

Rank pasture growth and weeds are mown when considered necessary. Particular attention is given to this aspect of pasture management during the summer months. A complete mowing is carried out during April each year to stimulate clover growth. A yearly topdressing with superphosphate is also carried out during the autumn months, at a rate of 3 bags to the acre. The improvement in soil fertility has resulted in the reappearance of paspalum, which is gradually suppressing the growth of the unprofitable mat grass.

Pasture harrows are used at regular intervals to spread the manure over the pastures.

Irrigation

Three small dams have been constructed conserve surplus water and an area of 6 acres pasture has been established under spray irrig tion. The pasture on this area is irrigated the rate of 1 in. an hour an acre and the li are moved every hour during the low rainf periods. A valuable fodder reserve is th ensured for that period of the year when grow is normally dormant.

Since 1954, 40 acres of improved pastures ha been established on this property. The da herd now numbers 60 and the quality of fe supplied from the improved pastures has enabl Mr. Lehmann to dispense with hand feeding.

Farm Income

The development of improved pastures on farm has allowed him to greatly increase t carrying capacity of his farm and thus expa farm income. Not only has total producti increased but the production per cow has al risen.

Plate 2

The Clover is now Thick and Tall and Dairy Herd Production has Increased.

Farm incomes obtained from dairying since 1953 are as follows:—

	£
1953	389
1954	446
1955	859
1956	1,298
1957	1,754
1958	1,897
1959	2,205

"It took many hours of hard work to improve the pastures on this farm," says Mr. Lehmann, "but I'm certainly reaping the benefit now in the form of increased returns."

Pasture Machinery

In the initial stages of this pasture development programme, all necessary land preparation and management was done with hired machinery. As the returns from the farm increased, Mr. Lehmann was able to buy his own machinery. Today the property is self-sufficient in these items.

The main equipment is a tractor. In addition he has a mouldboard plough, a bush and bog harrow, a set of pasture harrows and a 6 ft. power-take-off drag mower. The irrigation equipment comprises irrigation plant with an electric motor and 2½ in. pump and mains.

A modest dairy building was erected in 1953. A high standard of cleanliness is the keynote. A thorough cleansing programme and the provision of a refrigerator ensures a top quality product at all times. A special feature of this dairy is a footbath situated at the entrance gate to the bails. Little or no mud is carried into the bails on the hooves of the cows after they have walked through this footbath.

Has it Paid?

Mr. Lehmann considers that the £120 outlaid each year on the purchase of superphosphate to topdress the pastures is money well spent. "It would cost me more a month to feed my herd with concentrates," he says.

"Money spent on fertilizer for the topdressing of my pastures has proved a sound investment; money spent on concentrates can only be regarded as a short term relief."

Botany For Farmers. Although compiled in the first place for beekeepers, "The Honey Flora of South-Eastern Queensland" has a use for farmers and others interested in botany. It contains illustrations and descriptions of the important ironbarks, gums, bloodwoods, boxes, stringybarks, wattles, tea-trees, and cultivated plants such as lucerne, pumpkins, oranges and clover.

"The Honey Flora of South-Eastern Queensland" contains 199 pages and 178 illustrations. Prices are: In Queensland 15s. a copy, with a 3s. discount to registered apiarists, University botany students and booksellers; elsewhere £1 a copy.

pasture and crop

Do you need extra Tobacco Seedlings? Many people plant insufficient tobacco seedbeds to complete their field plantings, and as a result are obliged to obtain planting material from their friends.

The selection of planting material, if you have to obtain it from others, calls for care. This material should have had the same attention that your own seedbed received. Planting seedlings affected with blue mould is foolish. With such seedlings you run the risk of crop loss due to stem infection at an early age. In addition, you introduce a source of the disease to infect your own clean plants.

Select your seedlings with care and reject any planting material from a bed which has shown blue mould or which is not being well fumigated with benzol.

Your local tobacco advisers may be able to assist you in the selection of such seedlings.

—I. K. HUGHES, Plant Pathologist.

Choose a Cotton Variety to suit your Soil. An overseas authority on cotton growing has stated that success or failure in producing a crop of cotton probably depends more on the variety chosen for planting than on any other single factor. This is a sweeping statement, but a few minutes thought proves its significance.

There are many conditions and operations such as moisture and food supply to the plant, cultivation and insect control which govern the ultimate yield. If, however, the variety is unsuitable, all the effort may produce only a mediocre crop. Even though the yield may be satisfactory, quality of the lint may be affected, resulting in a drop in grade. Some of the finer diametered, long staple varieties, for instance, on fertile soils produce a strong fibre, while on poorer country the lint is weak and wasty.

The Department of Agriculture and Stock carrying out trials with cotton varieties in all th main cotton-growing districts, and field office can advise you on the most suitable variety f your soil type.

—W. G. STEELE, Senior Adviser in Agriculture.

Blue Mould in Tobacco Seedbeds. If you ha blue mould in your tobacco seedbeds, look f the cause. Generally you will find a source infection close at hand or within 100 or 200 yar of the seedbeds. Usually, infection comes fro a few stray, diseased tobacco plants. In som instances last year the sources of infection we 800 yards away, but in these cases it was lar and obvious.

Survey work has shown that early field infe tions result in a much greater loss from ste mould later in the life of the crop.

It is well to remember that if you fail to fir a source of infection causing blue mould in th seedbeds, it will still be there to infect your fie plantings early in their life.

It is not sufficient, once blue mould has show in seedbeds, to adopt proper benzol fumigati to correct the trouble. You must try to find th source of infection. Your local advisory office will help you to do this.

—I. K. HUGHES, Plant Pathologist.

Earthy Limestones. In many parts of Queen land, and particularly in black soil countr deposits of white or greyish white material a encountered when digging post holes or oth excavations.

These deposits are often quite extensive an the Agricultural Chemist is frequently required t determine what they are and if they have an value in agriculture.

Most of these deposits are earthy limestones sometimes containing magnesium, in which case they are classed as magnesian limestones or earthy dolomites.

Typical analyses of these earthy limestones range from 15 to 25 per cent. of lime with from three to 10 per cent. of magnesia in the magnesian limestones. Deposits containing 30 to 40 per cent. of lime and up to 15 per cent. of magnesia are not, however, uncommon.

Although lime (calcium) is an essential plant food, there is generally sufficient of it in other than strongly acid soils to meet the needs of the growing plant. The main value of the lime is then its property of being able to neutralise or reduce soil acidity.

Magnesium is also an essential plant food, and besides being a neutraliser of acidity the magnesia in the dolomite also takes its place as a plant food, particularly in magnesium-deficient areas.

The low-quality deposits can be used on the farm generally at about twice the rate recommended for limestones of better quality such as the crushed or ground limestone commonly supplied commercially.

The efficiency of limestone depends to a great extent on its fineness. Most of the lumps in the black soil deposits can be broken up with the back of a spade, or if a face is dug into the deposit, the material can be sieved by throwing spadefuls against a wire bed mattress supported in an inclined position with pieces of wood nailed on either side.

Only the better grade earthy limestones have a commercial value.

If the material is to be sold it must be registered under the Agricultural Standards Act and comply with the following specifications:—"Lime shall contain not less than 35 per cent. of calcium oxide (CaO) equivalent; provided that when magnesia (MgO) is present the total percentage of lime (CaO) and magnesia (MgO) shall not be less than 35 per cent."

The prescribed labels require to be set forth—

1. The names and respective percentages of active constituents and the form or forms in which they occur.
2. The neutralising value.
3. The degree of fineness.

Methods of determining these values are set out in the regulations.

The Agricultural Chemist is prepared to analyse material from deposits on farmers' properties and advise on its possible uses.

If the owner decides to sell the material he will require to seek the services of a consulting analyst or chemist to control the product and ensure that it meets the requirements of the regulations at all times.

—*W. R. WINKS, Chief Chemist.*

Weed Control in Crops. Chemical weed control is a valuable aid to the grain grower. To get the maximum benefit from these new herbicides, it is essential to understand how they work and when to apply them. 2,4-D and MCPA are plant growth regulators, not poisons, and if they are to be effective the plants you wish to control must be growing actively.

It is useless to spray weeds if they have ceased to grow through drought or dry conditions.

The best time to spray winter cereals is when the crop is 7 to 10 in. high or when the secondary roots are established and the crop can be grazed.

Avoid the seedling stage, and from shot blade to when the seed has set, or damage and reduced yield will result.

When you realise that only a few ounces to the acre of 2,4-D acid are required to control weeds, the importance of accurate spray equipment becomes obvious. *Remember, it is the amount of pure acid ingredient applied to each plant which controls your weeds.* Water is used as a dilutant to make it possible to apply the small quantities of the herbicide.

Experience has shown that failure to control weeds satisfactorily in past seasons can be attributed, in the main, to these points:

1. Incorrect identification of weeds.
2. Spraying at the wrong growth stage.
3. Application of the incorrect dosage of spray material.

The last point has been the main cause of failure, and I would emphasise that growers should equip their spray outfits with reliable and accurate spray nozzles. The "Monarch" nozzle is a reliable type.

Once the acreage covered by a tank load at a constant speed and pressure is known, it is a simple matter to apply any desired amount of herbicide to your crop.

All herbicides offered for sale in Queensland clearly state the percentage of active ingredient on the label. Most of these are liquids and each 10 per cent. equals 1 lb. of active ingredient.

—*S. R. KLOSE, Adviser in Agriculture.*

Marketing Potatoes. The quantity of potatoes sold each day on the Brisbane markets far exceeds all other vegetables, yet how many potato growers take the time and trouble to present their produce in such a way that will attract buyers?

Every grower knows that he must comply with certain grade standards provided under the Fruit and Vegetable Acts, and must brand his bags accordingly. However, it is the grower who packs uniform sized potatoes within these standards that gets top price.

The size requirement under the Act for a No. Grade potato is 3 oz. and over in weight. Ther is a big difference in the requirements of buyer On one hand you have the small shopkeeper— and there are many of them in Brisbane. He like to be able to weigh the potatoes near to hi customers' requirements. The large self-servic stores look for a medium-size potato becaus their customers, when selecting their potatoe from the bins, invariably pass over the larg tubers.

Cafes, fish-and-chip shops and potato flak manufacturers do not want potatoes too smal or too large, because these are hard to peel i mechanical peelers.

The hotel and residential trade, on the othe hand, do not mind large potatoes.

So you see, not only do evenly graded potatoes look attractive on display, but the produc agent knows at a glance with which custome he can place the various grades.

—*A. B. LOWRY, Markets Inspector.*

Mr. B. J. Carey, of Clifton, won Second Prize in Class 1, Section 1, at the 1960 Toowoomba Farmers' Festival, with this Mobile Welder.

Plate 1

Single Row Planting of Strawberries. Single row planting is practised in areas where ample water is available for irrigation and the crop is grown without a mulch cover.

Strawberry Growing in Queensland

By C. N. MORGAN, Senior Adviser in Horticulture.

The cultivated strawberry is a hybrid between two American species, *Fragaria virginiana,* fam. *Rosaceae,* and *F. chiloensis.* The plant is a squat, herbaceous perennial with dark green, serrated leaves and bears fleshy fruits with small seeds embedded in the surface. The fruits mature to a brilliant red colour. During the summer months, runners develop on the parent plant and root at the nodes. These runners are used as planting material.

The crop is grown in Queensland from the New South Wales border to the far north, but the main producing districts lie within an area extending from 80 miles north to 30 miles south of Brisbane. The mild winter in this area ensures a long picking period which frequently extends from June to the end of December. In central and northern Queensland, the cropping season is much shorter.

During the early part of the season, the fruit sells freely on the fresh fruit market in Queensland but many growers also consign to the southern States. By using fast rail and air transport, the fruit reaches the Sydney and Melbourne markets in first-class condition. Later in the season most of the fruit is consigned to processors for canning and jam making.

Varieties

A locally selected variety, Phenomenal, has proved satisfactory for Queensland conditions. It is vigorous and produces medium-sized, highly coloured, firm-textured berries which carry well and are suitable for the fresh fruit market and the processing trade. The variety bears self-fertile flowers and crops well without inter-planting with a second variety.

Virus diseases such as yellow edge and crinkle are a constant threat to the industry and production therefore depends largely on the use of runners from vigorous, disease-free, true-to-type plants.

Location and Soils

The strawberry crop must be grown in areas with ready access to markets and a relatively

Plate 2

The Phenomenal Strawberry. Phenomenal is the principal variety grown in Queensland. It is well adapted to the climate of southern Queensland and is in production from June to November each year.

mild climate. A reliable supply of water for irrigation is essential, particularly for crops grown on light-textured soils which dry out quickly during the winter and spring months.

Under favourable conditions, strawberries grow well on almost any type of soil though well-drained, sandy loams with a good water-holding capacity are generally preferred for the crop. However, irrigated plantings on the red-brown clay loams give satisfactory yields and, where the drainage can be improved, even the heavier clays may be planted. On badly drained soils, weed growth is difficult to control, root rots are apt to thin out the stand, and the plants usually lack vigour.

In the main producing areas at Redlands and Maroochy, land which is too cold for the more frost-susceptible crops during winter can often be planted profitably to strawberries. New land has some advantages, not the least of these being the small amount of weed growth during the first year of cultivation.

Land Preparation

Because the crop is planted in autumn, land preparation should begin in spring in order to get the soil into a good tilth. Though the strawberry is not a deep-rooted plant, ploughing to a depth of 8 in. is desirable. After the initial ploughing in spring, a cover crop of cowpea or maize can be sown and ploughed-under in summer. A further ploughing and the subsequent cultivation should then bring the so
into good condition for planting the strawberr
crop. Thorough cultivation before planting doe
much to level the ground and control weeds.

On the clays and clay loams, monsoonal rain
in February and March may interfere with lan
preparation before planting. The cover cro
should therefore be ploughed in by mid-Decembe
so that the soil will be in good tilth by the en
of January. On the loams and sandy loams
land preparation during wet weather present
less difficulty and the cover crop can remain unt
January.

Strawberries frequently do well after a lat
spring vegetable crop which has been fertilize
well and cultivated regularly during the growin
period. Land preparation is then comparativel
easy.

On shallow or heavy-textured soils, it is usua
to plant on raised beds.

Strawberries are fairly tolerant of acid soils
However, should the pH reading fall below 5·5
leaf symptoms of calcium or magnesium deficienc

Plate 5

Strawberry Plants in Bearing. Crop grown without mulch.

may appear in the crop. On such soils, dolomite should be broadcast over the ground at the rate of 1 ton to the acre during pre-planting tillage operations.

Fertilizing

Fertilizing practices depend largely on the cropping history of the land. Farmyard manure can be used to advantage, provided it is incorporated in the soil a few weeks before planting. Poultry manure is particularly useful and, unlike other sources of manure, does not introduce weeds to the cropping area. However, even when the land receives a liberal dressing (10 tons to the acre of farmyard manure), a 5-13-5 or similar fertilizer mixture should be applied before planting.

When farmyard manure is not available, a heavy preplanting fertilizer dressing is necessary and amounts of from 15 cwt. to 1 ton to the acre are not excessive. A 5-13-5 mixture containing a fair proportion of blood and bone is suitable for most soils. It should be spread in a band about 12 in. wide in single row plantings (20 in. wide in double row plantings) and thoroughly cultivated into the soil about 10 days before the runners are set out in the field.

Side dressings of fertilizer are usually needed during the growing period. The first side dressing is applied when flowering begins and this is followed, usually at four-week intervals, by further side dressings of up to 1½ lb. to the chain row for single row plantings or 2 lb. to the chain row for double row plantings. A water soluble 5-13-5 mixture is normally used. Side dressings rich in potash frequently improve the quality of the berries particularly in soils in which this element is deficient; a 4-13·5-12 or similar mixture is suitable for this purpose. Straight nitrogen fertilizers such as sulphate of ammonia should be used with caution, as they may produce excessive leaf growth, retard berry development and cause lack of firmness in the fruit.

In single row plantings, the side dressing fertilizer is placed in rings around each plant or, alternatively, in 4 in. bands on each side of the row. In double row plantings, the fertilizer should be distributed evenly over the soil between the two rows of plants. Side dressings are applied in such a way that little or no fertilizer comes in contact with the fruit or leaves. In order to avoid any risk of burning, however, the crop should be irrigated after each side dressing.

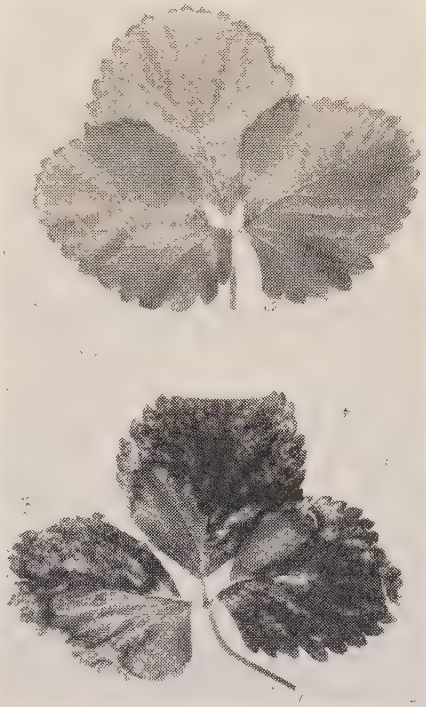


Plate 3

Fertilizer Burn in Strawberry Plants. The typical symptom is necrosis of the leaf margin and, in severe cases, death to the leaf. To avoid injury, the crop should be irrigated shortly after the application of a side dressing.

Establishing the Crop

Strawberries are grown in Queensland as an annual crop and the plants are seldom left in the ground for a second year. This practice is largely brought about by the difficulty of controlling weeds during the wet summer months, but quite apart from this, the fruit from a ratoon crop does not compare either in size or in quality with that from a plant crop. Annual planting is, therefore, sound practice.

Planting Material.—Planting material is usually obtained from a selected area reserved from the previous crop for runner production. Provided they are well looked after, 1,500 plants yield enough runners to plant one acre. Plants in the

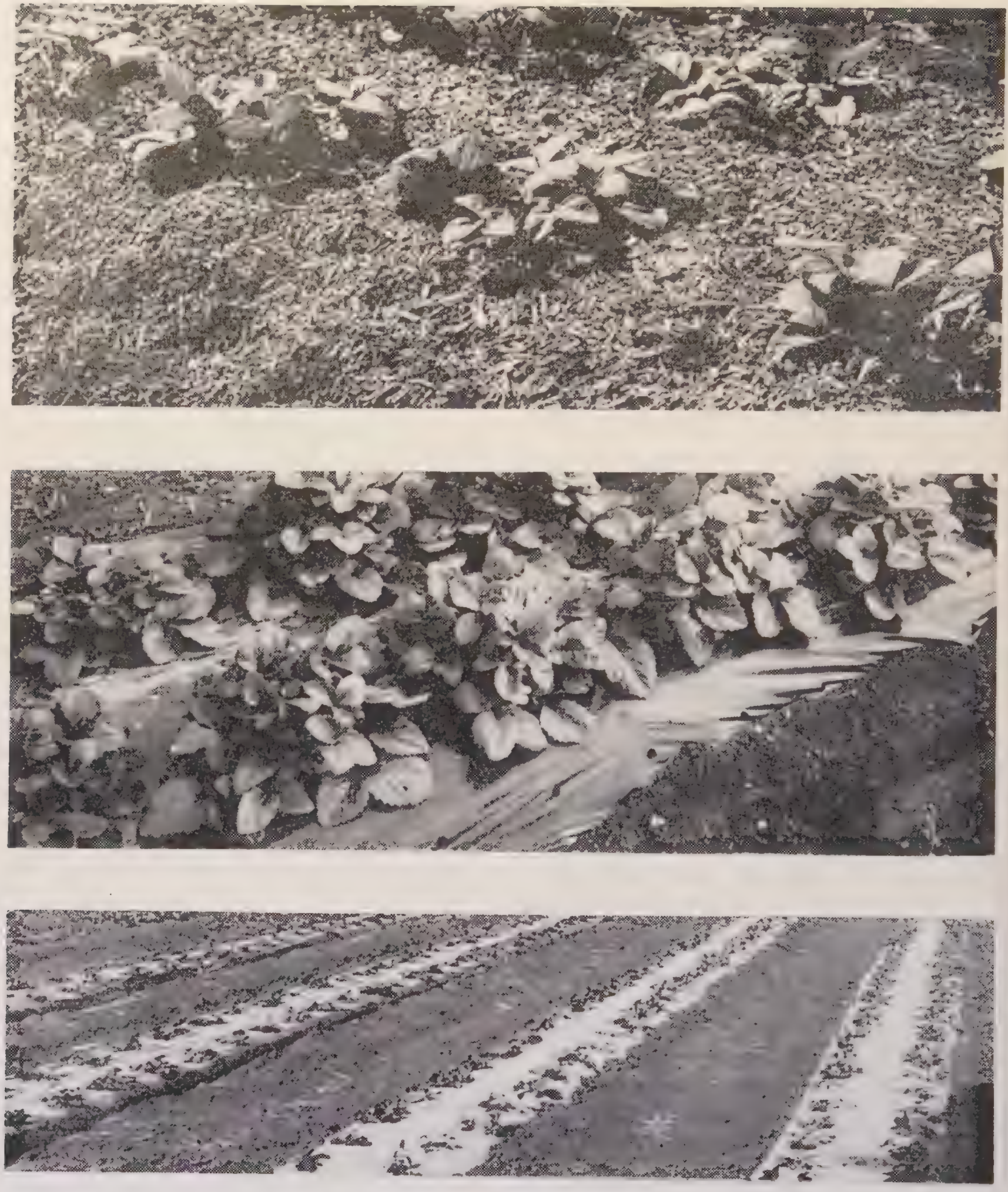


Plate 4

Forms of Mulching Materials. Top—Tanbark; satisfactory when applied at light rates shortly after planting. Excessively heavy applications may depress yields. Centre—Plastic sheeting; one of the best of the mulching materials but rather expensive. The crop must be watered regularly until the runners are well established. Bottom—Paper sheeting; has been used experimentally and shows promise. Considerable care is needed if wind damage and tearing is to be avoided when applied.

runner bed should be vigorous, true to type and free from disease; runners from inferior plants produce a most unsatisfactory crop. Severe rogueing must therefore be carried out in the runner bed, diseased and backward plants being destroyed as soon as they are detected in the field. Off-type plants should be clearly marked and then chipped out when picking is finished.

To encourage the production of sturdy, well-rooted planting material, the runner bed must be cultivated regularly and, if necessary, watered. A light side dressing of fertilizer when the runners first appear in December is required. Weeds grow rapidly at this time of the year and they should be controlled before the runners spread out between the rows. Runners growing in competition with weeds lack vigour; furthermore, they may carry weed seeds to the new area and these offset some of the benefits derived from pre-planting tillage.

Before removing the runners, the beds should be well watered to facilitate digging. It is best to start digging the runners at a given point and work through the area on a "face." The runners are lifted carefully and separated from each other with a small trowel or a strong-bladed knife, the roots being trimmed to about 3 in. and all broken and dead leaves removed. They are then placed either in a bucket containing a little water, or between wet bags, and protected from both wind and sun. No more runners should be dug than can be planted on the same day.

Only healthy runners with a good root system and a well-developed crown should be planted. The first and second plants on each runner are often preferred as planting material but it is a difficult and tedious job to sort them out. In any case, the crop grown from such plants seldom bears earlier than a crop grown from sturdy runners roughly graded for size before planting.

Planting.—Planting begins in the first week of March and continues for 3 weeks. Earlier plantings are difficult to establish, tend to be vegetative in habit and are slow to come into bearing. Later planted crops, on the other hand, develop slowly and are seldom productive.

Care in transplanting is essential, for the runner must be set with the crown just above ground level. If set too low, the crown silts up and the plant dies or makes unsatisfactory growth; if set too high, the roots may dry out. It is difficult to transplant runners at the right depth unless the land is in good tilth and has been allowed to settle. A wire is stretched along the row and the plants are set alongside it; the straight rows obtained in this way are easy to cultivate by tractor and hand implements.

Planting holes are made by hand or trowel and each plant is set at the correct depth with the roots well spread out. The soil is then firmed around the roots, care being taken to prevent dirt getting into the crown. As soon as possible after transplanting, the crop should be irrigated. Planting is best done in the afternoon.

Strawberry runners may be planted in single or double rows. A double-row planting takes approximately 40 per cent. more runners than a single row planting in the same area. Where ample land and water are available, single row plantings are generally preferred owing to the greater ease of watering and picking. However, double row plantings make better use of the available water when supplies are limited and, in mulched crops, reduce the cost of mulching material for any given number of plants.

Planting distances vary according to the implements in use but common spacings for single row plantings are 2½ ft. between rows and 15 in. between plants in the row. For double-row plantings, the best spacings are 3½ ft. between the centres of adjacent pairs of rows, with 15 in. between the two rows in each pair and 15 in. between plants in the row.

The numbers of plants required for an acre are shown in Table I.

TABLE 1

STRAWBERRY PLANTS PER ACRE

Single-Row Planting—

Distance between rows	Distance Between Plants In.	Approx. No. of Plants
2 ft. 6 in.	12 15	17,500 14,000

Double-Row Planting—

Between Centres of Double Rows	Distance Between Rows In.	Distance Between Plants In.	Approx. No. of Plants
3 ft. 6 in.	15	12 15	25,000 20,000

Management in the Field

Except in mulched crops, cultivation between the plants and in the rows is necessary to control weed growth. As the strawberry is not a deeply-rooted plant, only shallow implements can be use. A dutch or flat hoe is suitable for close work between the plants and small hand cultivators fitted with hoe attachments are generally used in the rows. Cultivators should be fitted with duck-foot tynes to ensure shallow working. When chipping by hoe, care must be taken not to pull soil away from the plants, and conversely not to lift soil into the crowns.

Irrigation.—Irrigation is essential for commercial strawberry production because the plants quickly react to dry weather, particularly during the cropping period. Lack of soil moisture is soon followed by a reduction in both fruit size and quality. Water is usually applied through overhead spray equipment such as that of the Skinner system.

The soil should be moist at the time of planting and runners set out in any one day require watering the same night to firm the soil. During the first two weeks after planting, the soil must not be allowed to dry out. In some seasons, this may involve daily irrigation and on very hot days it may even be necessary to irrigate twice. Lack of attention at this stage often results in an uneven stand of plants.

Once the crop is established, occasional heavy waterings which saturate the root zone should keep the plants growing satisfactorily until harvesting begins. From then on, about 30-50 points are applied regularly at intervals of three or four days. The amount required varies with the soil type, but sufficient water should be used to keep the plants in full production. On unmulched ground, splashing of the fruit is unavoidable, but the berries in the picking trays can be washed and allowed to drain in the packing shed.

Mulching.—Mulches are useful for controlling weed growth, conserving soil moisture and keeping the fruit free from dirt. On the other hand, some mulches may increase the risk of damage to the fruit from certain ground-frequenting insect pests. Various materials such as tanbark, wood shavings and plastic or paper sheeting are used as mulches.

Tanbark and wood shavings are spread around the plants to a depth of 2 in. on either side of the row and, in the case of double rows, between adjacent rows in the bed. The mulch soon settles down to a firm ground cover whic
gives some measure of weed control in the youn
crop. Heavier mulches, about 3–4 in. thic
though they effectively control weeds, tend
suppress plant growth and lower berry productio
Provided the land has been well prepared f
strawberries before planting, the tanbark and woo
shavings may be applied 2 to 3 weeks after th
runners are set out in the field.

Plastic and paper mulches are still in th
experimental stage but could prove very usef
if some problems of management can be solve
The sheeting is normally supplied in rolls, th
plastic being 36 in. wide and the paper 30 i
wide. It is placed in position before plantin
and held by a soil overlap on each side of th
slightly raised bed. An allowance of 1 ft.
every 15 ft. length must be made for shrinkag
after new sheeting is laid out. Slits about 6 i
long are made in the sheet at each plant positi
to permit insertion of the runners about a wee
after the sheets are laid out. Frequent waterin
is necessary in strawberry crops mulched wit
plastic sheeting to minimise the risk of he
damage to the young plants. Plastic sheetin
is supplied in thicknesses of ·0015 in. and ·002 i
for use in the crop.

Sawdust is not a satisfactory mulching materi
for strawberries; it sticks to the ripe fruit a
is difficult to remove when the crop is harveste
If used, it should be checked before use for t
presence of boron as sawdust from timber treat
with boron for the control of borers may car
injurious quantities of this element. There
a somewhat similar risk involved in the u
of wood shavings from timber treated with PC
(pentachlorphenol) for the control of mould.

Harvesting

Strawberries should be picked for the fre
fruit market with the stems on and when abo
three-quarters coloured. The stems are remove
however, from fruit consigned to factory f
this fruit is normally allowed to develop fu
colour. To handle the crop successfully, dai
picking during the main part of the season
often necessary and rarely is it possible to allo
the interval between pickings to extend beyon
two days.

A well-grown crop should yield at least 1 l
of berries to each plant which is equivalent
approximately 6 tons to the acre in double ro
plantings.

stock and station

This Rooster Has Scaly-leg. Plate 1 shows the legs of a 3-year-old rooster from a backyard flock. Note the extreme thickening of the scales on the shanks and feet. Most of the normal, flat, shiny scales have become replaced by thick, spongy crusts. This is a condition in fowls called scaly-leg.

It is caused by a mite called the scaly-leg mite, *Cnemidocoptes mutans,* which is little bigger than a speck to the naked eye.

This mite burrows under the scales of the unfeathered parts of the fowl's leg. In exceptional cases, the mite also attacks the skin of the comb and wattles, causing the formation of crusts. Severe cases of scaly-leg are unsightly and the affected bird is disinclined to walk.

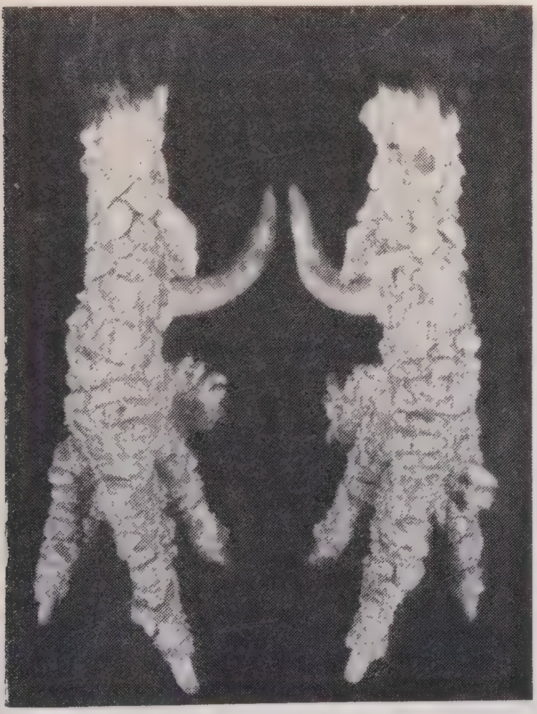


Plate 1
Scaly-Leg in a 3-year-old Rooster.

The mites pass their entire life cycle in the skin. Spread from infested to uninfested fowls appears to be slow and probably occurs from the perches (the lesions spread from the bottom of the bird's legs upwards).

Scaly-leg typically affects old fowls, severe cases not being seen before 3 years of age. The disorder is fairly common in backyard flocks, due, no doubt, to the tendency of householders to keep older fowls. In contrast, scaly-leg is seldom seen in commercial flocks. Poultry farmers usually dispose of their flocks for table purposes before the fowls are 2 years old.

Although turkeys can act as hosts for the mite, scaly-leg in them is rare, since they are usually kept under range conditions.

In budgerigars, a disorder called scaly-face is caused by a similar mite, *Cnemidocoptes pilae.*

The most satisfactory way of controlling scaly-leg in fowls is to dispose of the birds at an earlier age. In addition, any fowls showing leg lesions should be culled or isolated.

Treatment of fowls will usually produce a response but may not result in a complete cure in all cases. Dipping the shanks in a tin of light diesel fuel has given good results. Sump oil or raw linseed oil may be used when thinned with kerosene (two parts of oil to one of kerosene). Insecticides such as BHC applied by a brush have also been recommended. At the same time, the perches in the fowl-house should be brushed over with sump oil, creosote or an insecticide. These measures should be repeated at weekly intervals until 3 or 4 treatments have been carried out.

—*P. D. RANBY, Veterinary Officer.*

Whole Grain for Sheep. No advantage is gained by grinding or crushing grain before it is fed to sheep. This has been made clear by both feeding trials and observations in the paddock.

Of all farm animals, sheep are best able to do their own grinding. In drought feeding trials, wheat, oats, maize, barley and grain sorghum have all been fed whole. Each of these grains has been fed as a sole diet, except for the addition of finely ground limestone, for periods up to eight months. In this time there has been no evidence that undigested grain was passing through the animals.

Even when urea was fed with the grain in trials, crushing offered no advantage.

But crushed grain has a place when old sheep with poor teeth are being fed. Crushed grain is also better for young lambs up to 5 or 6 weeks old. If grain has to be prepared before being fed to sheep, it should be ground coarsely or crushed. It should not be ground into a fine meal, as this is not so palatable as the coarser material.

Ewes that have been on water high in fluorides for a long time are likely to have their teeth affected. These ewes may do better on crushed grain than whole grain. In drought feeding this class of stock, it may be better to give them cracked maize in troughs rather than broadcast whole maize.

On the Darling Downs, where self-feeding is common in sheep raising, the ration is usually made up of equal parts of grain and roughage. The main reason for using the roughage is to prevent grain poisoning or acidosis.

In practice, the grain is added to the roughage and both are then put through a hammermill. The mixing of the grain and roughage before hammermilling is intended mainly to ensure an even spread of the grain through the roughage. Although the grain does go through the hammermill, the wide screening allows much of it to pass through unground, but well mixed through the roughage.

—*R. B. YOUNG,*

Senior Adviser in Sheep and Wool.

Bracken often Kills Young Stock. Many stock owners who live in the elevated, high rainfal districts of Queensland do not realise just how many deaths are caused by bracken fern poisoning, especially in young cattle. Bracken fern poisoning is most serious in such areas as Maleny, Mt. Mee, Eungella and Atherton Tableland districts.

Many of the deaths attributed to snakebite are, in fact, caused by bracken fern. This is easy to understand, because affected stock are not noticeably sick for more than a day or so. The result is that stock are often found dead. Furthermore, there are no obvious external signs.

The young, fresh fronds of bracken fern are the most dangerous. Experiments have shown that stock can eat bracken fern for a long time without any obvious ill-effects. Then fatal symptoms can build up in a period as short as 24 to 48 hours.

Bracken fern poisoning has rightly been described as a chronic disease with an acute ending.

Bracken fern is one of the few plant poisons that consistently give a high temperature. Other symptoms that may be seen include minute haemorrhages in the mucous membranes of the gums, anaemia and occasionally staggering associated with it, and blood flecks in the droppings.

On post-mortem examination, diagnosis is simple to those who have had experience with bracken fern poisoning. The animal virtually bleeds to death internally. Haemorrhages can be seen under the skin and in the tissues and organs of the body, while the last portion of the large bowel is usually filled with blood.

If you think you are losing stock from bracken fern poisoning, call in a veterinary surgeon or a stock inspector, who can confirm the diagnosis and prescribe treatment. Young stock, which are the ones commonly affected, should be shifted to another paddock immediately and supplied with a bonemeal lick.

Even though the paddocks of your farm carry only a light infestation of bracken fern, losses from bracken fern poisoning are still likely. In fact, such farms are often the ones most severely affected.

—*S. G. KNOTT, Divisional Veterinary Officer.*

Heavy Weaners Increase Profits. Pigs which are 20 lb. or more above the average weight at weaning have a big start on their way to becoming baconers. What's more important, this extra weight is put on at the stage in their growth when less than 2 lb. of feed is needed for 1 lb. of live weight gain.

The Department of Agriculture and Stock is investigating factors which influence litter weights at weaning. When the trials started about two years ago litters averaged a little above 30 lb. at eight weeks. Creep feeding with improved rations brought the average up towards 40 lb.

Improvements in housing, hover boards and false ceilings, and better creep feeders and waterers, brought the average of some Berkshire weaners up as high as 54 lb. at Hermitage, near Warwick. Large Whites at Kairi, in north Queensland, have done even better with this improved equipment. The last two litters weaned there averaged 56 lb. and 58·6 lb. at 56 days.

The heavy weaners have continued to grow quickly after weaning. A Berkshire pig from a litter of nine at Hermitage weighed 55 lb. at weaning, and just before slaughter at 19 weeks old weighed 172 lb. alive. The carcass weighed 126 lb. and was graded prime.

A few farmers are already rearing litters to equal those, and many more can do so if they give their young pigs a warm, dry, draught-free shed, and creep feed them correctly. Money spent on growing big healthy weaners will prove a sound investment.

—*T. ABELL, Senior Adviser, Pig Branch.*

Keep Fowl Pox in Check. Routine vaccination of all chickens is a sure way to avoid production losses through fowl pox. Vaccinnation confers such a high degree of immunity on chickens that, these days, there is no need for fowl pox to be a problem at all.

Outbreaks of fowl pox occur in many Queensland poultry flocks every year. Although this disease kills only a few birds, its real harm lies in the sharp drop in egg production in affected flocks. Fowl pox usually strikes pullets just commencing to lay, and many of the birds will go off the lay. In others, commencement of laying may be delayed.

Fowl pox is a highly infectious disease and is found in all parts of the State where poultry are kept. The disease is transferred from bird to bird by mosquitoes, and when the mosquito season begins in spring or early summer outbreaks of fowl pox usually increase.

Wart-like sores on the unfeathered portions of the bird, especially the comb, face, and eyelids, are the main symptoms of the disease. Sometimes the disease attacks the membranes of the throat and may cause suffocation.

Permanent immunity can be conferred on a poultry flock by vaccinating with fowl pox vaccine. Because it can cause a severe general reaction 18 to 21 days after vaccination, it is best to wait until the birds are between 8 and 12 weeks old before using fowl pox vaccine. The general reaction may lower the birds' resistance to chronic respiratory disease, coccidiosis, worms and so on. Birds showing symptoms of any disease should not be vaccinated with either fowl pox or pigeon pox vaccine.

Because of the risk of a severe general reaction from fowl pox vaccine, pigeon pox vaccine is becoming popular in Queensland. There are no ill-effects from this vaccine, and even day-old chickens may be vaccinated with perfect safety.

Pigeon pox vaccine confers immunity for about 4 months, but in commercial flocks it is usually found that only one vaccination is necessary. Pigeon pox vaccine is best used on chickens hatched from July onwards.

If you need advice on the method of vaccinating fowls, consult the Poultry Branch officer in your district. A demonstration of the method may be arranged.

—*C. MANNING, Senior Poultry Adviser.*

Feeding Started Chickens. Don't neglect your chickens' rations in the rearing period between weaning at eight weeks and maturity. After putting a good deal of time and money into getting them through the difficult brooding stage, it would be folly to reduce the quality of their ration from then on.

Although the growth rate decreases during this period, the amount of food the birds eat increases. A mash and grain or all-grain system of feeding may be adopted. But in each case the protein content of the ration should be 16 per cent. Greater quantities of more fibrous foods like lucerne meal may be used.

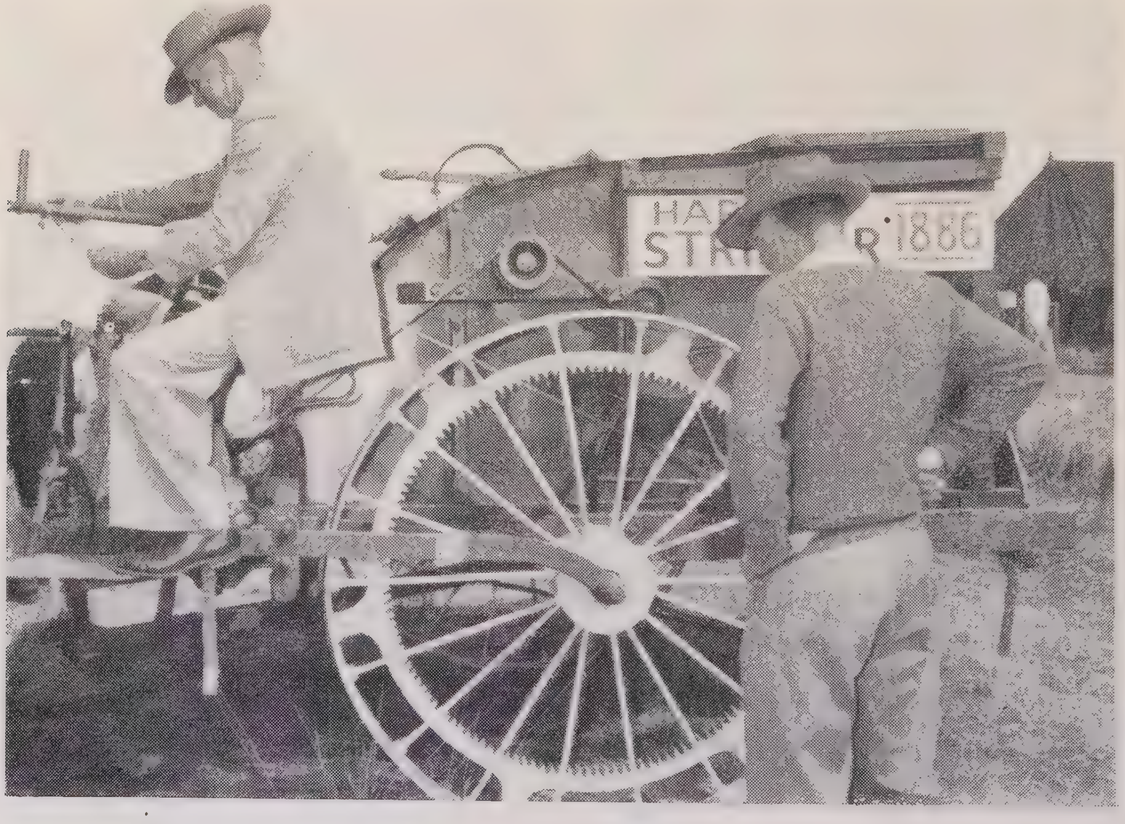
After weaning, growing stock do not require the previous high levels of riboflavin. For this reason, the amounts of costly riboflavin-rich foods like livermeal, buttermilk powder or whey powder may be reduced or even left out of the ration. If an adequate supply of succulent green feed is available (5 lb. a day to each 100 birds), vitamin A supplements also can be left out of the ration.

It is important to remember that a shortage of vitamin A during the rearing period can undo all the benefits from the care and attention given during the brooding and weaning stages. Continued use of a vitamin A supplement would be a good insurance.

As pullets approach maturity, their calcium needs increase in anticipation of the coming egg-laying season. Most of the calcium reserves are deposited as extra bone in the skeleton, and is drawn on when egg-laying starts. In the period between weaning and maturity, pullets should have shell grit or non-dolomitic limestone grit before them all the time.

Pullets housed intensively cannot make proper use of calcium and phosphorus unless cod liver oil, fish oil emulsion or some other preparation containing vitamin D3 is added to the ration This should be borne in mind during the later rearing period.

—*F. N. J. MILNE,*
Senior Poultry Husbandry Officer.



Mr. J. Yeats, Kumbia, via Kingaroy, Tests the Controls of an 1886 Model Stripper which Won First Prize in Class 2, No. 1, at the Toowoomba Farmers' Festival of 1960.

Goats at Blackall.

Milch Goats in Queensland—II

By G. I. ALEXANDER, Senior Cattle Husbandry Officer.

Many diseases affect goats, causing unthriftiness, loss of milk production and sometimes death. Careful feeding and management will prevent or lessen the severity of many of these conditions. If the disease is one which is serious or which has not been experienced before, it is desirable to get the advice of a veterinary surgeon promptly, as delay or the use of home treatments may prove fatal.

The diseases discussed in this section do not all occur in this country but are of interest to most goat breeders.

Mastitis

There are two main forms of mastitis—acute and chronic—caused by the same organism (*Streptococcus agalactiae*) as that causing the common form of mastitis in cattle.

Symptoms.—The acute form of mastitis often occurs soon after kidding but may occur up to the middle of the lactation. There is usually a hot, tense, painful swelling of one or both sides of the udder. A small amount of watery or bloodstained milk may be squeezed from the affected udder.

The chronic type is similar to that affecting cattle and is difficult to treat. The udder is no longer firm and smooth to the touch, but, on massaging, lumps of fibrous tissue may be felt in the substance of the udder. This fibrous tissue replaces the infected secretory tissue and so decreases the milking capacity of the animal. The milk in chronic mastitis may contain clots or may be watery. Chronic mastitis may occur as a sequel to acute mastitis or it may be chronic from the beginning. The production of the affected half of the udder is decreased, and unless the condition is cleared up, will continue to decrease.

Treatment.—The treatment for the acute type is to apply frequent hot fomentations to the udder. Constant stripping of the udder is also necessary, as this aids elimination of the organism.

Penicillin infusion is the only effective treatment. Three infusions of 25,000 units every 24 hours are necessary. The udder should be stripped before infusing the penicillin. The penicillin tubes as used for mastitis in cattle are suitable, one being used for each infusion.

Chronic mastitis is treated similarly with infusions of penicillin. It is less responsive to treatment than acute mastitis and affected does may remain as a source of infection to the rest of the herd. Therefore, it is often desirable to cull any does with bad cases of chronic infection.

Prevention.—Careful washing of the udder with an antiseptic such as a hypochlorite solution before and after milking, and drying of the teats, are measures to be practised. A strip cup is useful in detecting any cases; the first milk may be directed into the strip cup before milking. Goats affected with mastitis should be milked last and the affected milk mixed with a disinfectant such as Lysol or hypochlorite and destroyed, or it may be boiled.

All utensils, especially those coming in contact with the affected milk, should be scalded.

Milk Fever

This usually occurs after kidding, but in some cases it may occur just before or up to several months after kidding.

Symptoms.—The first symptoms noticed are a loss of appetite and lassitude; the breathing becomes slower and shallow. The doe staggers about, and eventually lies down and cannot get up. The hindquarters become paralysed. She bleats occasionally, becomes unconscious and may die if not treated. If practicable, a veterinary surgeon should be called in to give the doe injections of calcium borogluconate, which are made by a skilled operator into the jugular vein or the mammary vein and under the skin. If unable to enlist the aid of a veterinary surgeon, the owner may inject the whole dose under the skin, but this has a slower action. In these circumstances, a dose of 40-60 c.c. of a 20 per cent. solution may be administered.

If no calcium borogluconate is available, pumping up the udder over a period of about two hours may be tried. The udder is pumped up, using an ordinary milk fever outfit incorporating a bicycle tyre pump and a sterilized teat syphon, until quite tense. The teats are then tied off with a bandage, which should be removed every half hour to allow the teat to be massaged, and re-inflated. It may not be necessary to tie off the teats, as many will remain inflated without tying off.

Prevention.—It is impossible to prevent milk fever, as it is not due to a deficiency of calcium but to the inability of the doe to use the calcium salts available in her body.

Goat Pox

Goat pox is a disease similar to cowpox and is transmitted from goat to goat by the milker's hands. It is transmissible to humans. When a goat has recovered from an attack of the disease it is immune to further attacks for quite a long time, usually for life. The introduction of an infected animal into the herd is the most common source of infection. Kids may develop sores on the face if allowed to suckle affected goats.

Symptoms.—Goat pox first appears on the teat as brownish-red, circular areas about the size of a threepenny coin. These develop into watery blisters which become full of pus. Scabs form later. The affected areas cause pain at milking and rawness of teats due to constant rubbing off of scabs.

Treatment.—Milk affected goats last and wash hands and udder cloths in hypochlorite or a similar disinfectant solution before handling other goats.

Before scabs develop paint the sores with triple dye solution, a preparation obtainable from chemists. A mixture containing 10 per cent. sulphathiazole and 10 per cent. salicylic acid in paraffin, rubbed well in, is also very useful in treating the pox lesions. After the scab develops, rub Whitfield's ointment, which is an iodine ointment, well into the entire teat before each milking.

Prevention.—If the goats are badly infected it may be advisable to vaccinate the kids. For this, a qualified veterinary surgeon should be engaged.

Contagious Ophthalmia (Pink Eye)

This is a similar disease to pink eye in sheep. It usually occurs under hot, dry, dusty conditions when flies are numerous or when grass is seeding heavily. These lead to irritation of the eye and produce ideal conditions for the multiplication of the organism. The trouble is mostly seen in young animals in spring, summer and autumn. It is highly infectious and spreads rapidly.

Symptoms.—Irritation and inflammation of the membranes lining the eyelids and eyeball are the chief signs; they are accompanied by cloudiness of the eyeball and a copious discharge of tears. The discharge from the eye becomes thick and the lids may become full of pus and stick together. The affected animals shut their eyes and avoid light as much as possible. One eye is frequently affected first, but the other eye often becomes affected within a few days. Both eyes are usually affected to the same degree.

Commonly, recovery begins in three to four days and is complete in seven to 10 days. More severe cases may last six weeks, and in rare cases the eye may become permanently blind.

Treatment.—Affected animals should be placed in clean, darkened quarters and given water and laxative nutritious food.

A few drops of 10 per cent. argyrol placed in each eye after first washing the eyes with warm saline solution are beneficial.

Penicillin ointment such as is used in the treatment of mastitis, while not curing the ophthalmia, will reduce the severity of the disease. It may be applied twice a day at each milking time.

Chloromycin eyedrops are possibly the most effective to use if obtainable.

Retained Afterbirth and Metritis

Retention of the afterbirth is common in does which have had a difficult kidding, requiring assistance. It is advisable therefore to examine the afterbirth to see that no part of it has been left.

If there is any retained, a veterinarian should be consulted immediately because 4 days after kidding the opening into the womb decreases in size and the retained afterbirth cannot escape and subsequently putrifies.

Symptoms: If the afterbirth has not been noted as being retained, the first sign is a brownish, slimy discharge from the vagina or breeding passage which soils the tail. If not treated, the doe goes off her milk and loses her appetite.

Treatment: A veterinary surgeon should be called in immediately. He will usually treat the infection by giving an intra-muscular injection of stilbestrol, which has the effect of maintaining the opening into the womb. This enables him to treat the infection in the womb by irrigation with suitable disinfectant solutions. Stilbestrol tablets may be given by mouth and have a similar effect.

If a veterinarian is not available, the doe may be given sulphamezathine tablets (0·5 gm.). The dosage recommended is 10 tablets at first followed by 5 tablets at 12-hourly intervals for five days.

Cystitis (Inflammation of the Bladder)

Cystitis is sometimes seen in does after kidding.

Symptoms: The characteristic symptom is straining and adopting the stance for urinating. Often no urine will be passed and the little urine that is passed is cloudy and may contain pus or blood. The tail and breech area are soiled and may even scald. The animals are dull and lethargic, and die unless treated.

Treatment: As for retained afterbirth and metritis, veterinary attention is desirable; the earlier it is rendered the better the chance of recovery.

If veterinary advice cannot be obtained, the most effective treatment is sulphathiazole tablets (0·5 gm.) giving 8-10 tablets initially and 4-5 tablets at 12 hourly intervals for 5 days. Ample drinking water should be provided.

Urinary Calculi (Stones in the Bladder)

This condition is rare in goats, the only outbreak recorded in Queensland being one near Clermont. It is reported to occur mostly in male goats on pasture, but it may affect hand-fed male animals. The calculi are composed mainly of calcium and magnesium salts.

The cause of the production of the calculi is not known, but water containing excessive amounts of minerals and a decreased water intake are suspect. There seems to be some association also between the incidence of urinary calculi and an abundance of lush herbage which has a high content of lime and magnesium salts.

Symptoms.—The animals are restless and strain to urinate. Urine dribbles out while the animals are not straining. They stand with arched backs, stamp with their hind legs, kick at the abdomen and wriggle the tail. They often lie down and bleat constantly. The goats are tender around the rear of the abdomen.

After two or three days, they usually die following rupture of the bladder.

Treatment.—Treatment is not very satisfactory. Surgery by a veterinary surgeon, if attempted in the early stages, is often successful.

Sore Teats

Occurring most commonly in the colder months, chapped and cracked teats are usually associated with failure to dry the udder after milking. Wounds to teats may be due to thorns, to barbed wire or to being trodden on.

Treatment.—Treatment should be similar to that for goat pox, and should be before milking.

Wounds may be treated by binding with adhesive tape. If they involve the milk duct, veterinary attention is necessary. The side should never be left unmilked even if it slows healing of the wound.

Impaction (Constipation)

This condition occurs mostly in older animals fed on hard dry feed or fibrous roughage.

Symptoms.—The first sign is absence of cudding. A lack of appetite and a fall in milk yield are also noticeable.

Treatment.—Five to six fluid ounces of liquid paraffin or raw linseed oil should be given as a drench immediately and the stomach should be kneaded for 10 minutes every two hours. The animal should be offered young green succulent feed. Severe cases may require the rumen or paunch to be opened and some of the impacted material removed.

Bloat

The cause of bloat is not fully understood but the trouble usually occurs when the goats are on very succulent pasture, especially legumes. It may sometimes occur associated with impaction.

Symptoms.—The symptoms of bloat are similar to those of impaction but they are more acute. The abdomen, particularly the left side, is greatly distended. The animal may have great difficulty in breathing.

Treatment.—Drench with five to six fluid ounces of raw linseed oil with a teaspoonful of turpentine. If the bloat is severe, a trocar and cannula should be inserted into the paunch on the left side of the animal at a spot equidistant from the last rib, kneecap (or stifle) and the edge of the loins.

Laminitis

Laminitis occurs after heavy over-eating on grain or whey, and is occasionally due to excessive walking or after high fevers.

Symptoms.—Acute lameness in one or all four feet is the chief sign. The feet are hot and painful. The animals lie down or kneel down if only the forelegs are affected. There is a fall in milk yield and depressed appetite.

Treatment.—Drench with 2-3 fluid ounces raw linseed oil daily, give the animal plenty of roughage and reduce the intake of grain.

Hot fomentations should be applied to the affected feet three to four times a day, 20 minutes at a time.

Scabby Mouth (Contagious Pustular Dermatitis)

Scabby mouth is a disease affecting sheep more commonly than goats. However, goats can be affected in the same way as sheep. The disease is infectious and is transmissible to human beings. It is caused by a virus which affects the skin. The disease, while not responsible for many deaths, causes much loss of condition and retards growth.

Symptoms.—The earliest symptoms are a slight swelling of the lips, which are soon covered by a sticky material which seeps through the skin. This develops into a hard scab which extends with the continued exudation of fluid until it may be up to half an inch thick. The scabs are usually dark-grey in colour. They are mostly around the lips but may occur on the nostrils, around the eyes and just above the hoof, as well as on the udder of the does. Sometimes sores may be seen on the gums and inside the mouth; these bleed if the scabs are knocked off before the skin underneath the scab has healed.

The time taken for the scabs to form and fall off is from 12 to 20 days.

The scabs may prevent kids from suckling and they will lose a lot of condition due to lack of feed. Affected kids suckling does will often infect the udder of the doe and cause the formation of scabs on the teats and skin of the udder.

Treatment.—Isolation of the affected animals is the best method of countering the spread of the disease. The ordinary case is best left alone without treatment until it recovers. More severe cases may be treated by applying an oily or fatty dressing to soften the scabs. Antiseptics are of little or no value.

Prevention.—When the outbreak first occurs, it is necessary to vaccinate all the stock immediately. Following this it is necessary to vaccinate the young stock every year at about six weeks of age. The vaccination is carried out by scratching the inside of the thigh of the animal with a needle which has been wetted with the live virus. Care is necessary while handling the vaccine.

Tuberculosis

This has not been recorded in goats in Australia.

Brucellosis (Malta Fever)

This disease, which resembles brucellosis (contagious abortion) of cattle and sheep, has not been recorded in Australia.

Parasitic Diseases

Goats, like sheep, can suffer severely from the effects of internal parasites. Mortality can at times be serious but there are also the less obvious effects of parasitism such as failure to grow and loss of condition and production. These latter effects are often not spectacular and so may be overlooked by the stock owner.

Worms are not capable of breeding within their host and must spend a portion of their life cycle outside the goat. The female worm lays the eggs which pass out with the droppings on to the pasture. In the case of tapeworms, their eggs are eaten by a small mite and if this mite is swallowed by a goat the young tapeworm is set free and grows to maturity. The mite acts as an intermediate host for goat tapeworms just as the goat acts as an intermediate host for some of the dog tapeworms. Roundworm eggs on hatching give rise to tiny larval worms which undergoes a period of development on the pasture. In 4-5 days the larval worms, now known as infective larvae, are ready to infest a goat; they migrate up blades of grass and are then available to the grazing animal.

The external parasites of goats do not assume the same importance as the internal parasites as, with the exception of tick paralysis, they rarely cause mortality. However, they can cause considerable worry and irritation and so result in a lowered milk yield. As they affect the coat of the animal, they are more readily seen and so may be much more easily controlled than the internal parasites.

Internal Parasites

Large Stomach Worm or Barber's Pole Worm (Haemonchus contortus).—This is a slender worm, half an inch to one-and-a-half inches long; on close examination it is seen to have a twisted red and white striping of its body. It is one of the most important internal parasites of goats.

Anaemia is the chief sign of Haemonchus infestation and is indicated by pale skin and mucous membranes of the eye and mouth. The animals sometimes lose condition rapidly and

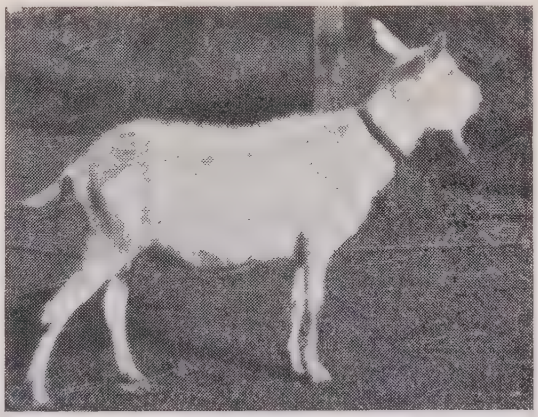


Plate 16

Goat Suffering From "Bottle Jaw," a Soft Swelling Below the Jaw which often Develops with Barber's Pole Worm Infestation.

often develop a "bottle jaw," which is a soft swelling below the jaw. There is often no scouring associated with this disease. The goats have no stamina and the milk production of the does falls off rapidly.

The female worms produce enormous numbers of eggs, so a pasture may become heavily contaminated in a relatively short period of time. The disease is frequently of sudden onset due to the rapid building up of the larvae in the pasture, and goats in prime condition may die. It affects goats of all ages but its effects are seen more noticeably in very young and in aged goats.

Periods of heavy rainfall and warm weather create ideal conditions for the survival of the infective larvae on the pastures, so infestations occur during the summer rainy season. Any factors lowering the condition of the goat, such as malnutrition, imperfect teeth and the strain of pregnancy and lactation, render it very susceptible to heavy stomach worm infestation.

Small Stomach Worm (*Ostertagia spp.*).—The small stomach worm, which is a small brown worm, is found in the fourth stomach near the opening into the small intestine.

The symptoms of heavy small stomach worm infestation are not very clear-cut. They include slight anaemia, diarrhoea and loss of condition.

The small stomach worm is more resistant to cold than the large stomach worm and is found in colder areas. It is not of such great importance as either the large stomach worm or the black scour worm.

Black Scour Worms or Hair Worms (*Trichostrongylus spp.*).—These small hair-like worms are found in the small intestine. They are very difficult to see but if a portion of the intestine is stretched and held up to the light the worms can be seen as reddish-brown streaks on the lining.

Scouring and loss of condition in young goats during the cooler months of the year should arouse suspicion of small intestinal worm infestation. Anaemia is rare in this disease, in contrast with large stomach worm infestation. The onset of the disease is usually gradual and many animals may be affected before the owner begins to suspect the disease is present. The goats most commonly affected are those up to two years of age.

Eggs of this worm, when containing a youn larva, are very resistant to coldness and dryness A fall of rain after a period of dry, cold weathe may produce mass hatching of the eggs and lea to heavy contamination of the pasture with hair worm larvae.

Malnutrition is a common predisposing caus of black scour worm infestation and a high plan of nutrition is a sound control measure to adopt

Tapeworms (*Moniezia spp.*).—Tapeworm are found in the middle and towards the end o the small intestine. They are white segmente worms which may grow many feet in length Except when heavily infesting kids, they do no seem to cause any great trouble. The tapeworm usually pass out of the animal after about three months without any treatment.

Whipworms (*Trichuris ovis*).—This parasite has a long thin neck about one inch long and a short thick body. It is found in the caecum or "blind gut" and has not been found to cause any trouble in goats.

Nodule Worm (*Oesophagostomum columbianum*).—The nodule worm is a creamy-white worm, half an inch to three-quarters of an inch long. The adult worms are found in the large intestine but part of their life cycle is spent in the wall of the large and small intestines, whe they form nodules. High summer rainfall provides ideal conditions for the parasite and the disease produced by the worms is most severe in wet districts. The larvae develop slowly in the wall of the bowel and may not cause any symptoms until late autumn or winter.

Heavy infestations with nodule worm cause the goats to become debilitated and develop a humped back and characteristic stiff action of the hind legs. The tail is frequently held up at an angle from the body. Soft faeces containing much slimy mucus and sometimes streaks of blood are passed.

Lack of feed during the winter months will aggravate the condition, so it is essential to supplement the winter grazing.

The adult worms affect chiefly young goats, but older goats which have had long continued infestations may develop such an extensive nodule formation in the intestine as to interfere with the proper function of the bowel. This may cause the goat to become unthrifty and not capable of improving in condition.

Bladder Worm (*Cysticercus tenuicollis*).—This is the intermediate or cystic stage of a dog tapeworm. It is found in the abdominal cavity, hanging from the mesentery (the membrane to which the bowel is attached) and may be up to two inches in diameter. The goat becomes infested by eating grass contaminated by dogs' faeces.

Hydatids (*Echinococcus granulosus*).—This is also the intermediate stage of a dog tapeworm but has greater significance as it can also occur in man. The hydatid cyst varies in size from a quarter of an inch up to three inches or more in diameter; it is usually found in the liver and lungs, but can occur in any of the organs. The goat is infested by eating grass contaminated by dogs' faeces. Since people can become infested by handling the dogs, some measure of control of this disease must be adopted. The most practical method of control is not to allow dogs to eat any of the raw offal from goats (or sheep, pigs, cattle) which have been slaughtered for meat. This prevents infestation of the dog and this in turn prevents further infestation of the goats and any people handling the dogs.

Treatment.—The internal parasites of most consequence are the large stomach worm, black scour worm and nodule worm.

The usual drench employed is phenothiazine, which is marketed in the form of a powder which will form a suspension when mixed with water. Ready prepared suspensions are also obtainable.

The most convenient method of drenching goats is by means of a 1-2 oz. drenching syringe designed to handle the thick phenothiazine suspension.

The powder is usually packed in 1 lb. and 7 lb. containers. The best method of mixing the drench is to put the required amount of powder in a container, add water gradually and stir until it becomes a creamy suspension, then run the mixture through a fine sieve to remove any lumps. A measuring jug marked in fluid ounces and pints is of great assistance in making up phenothiazine.

The dosage of phenothiazine powder recommended for large stomach worm and nodule worm in goats of various ages is:—

Adults	¾ ounce.
8-12 months	½ ounce.
4-8 months	⅓ ounce.

If 8 oz. of phenothiazine are mixed with half a pint (10 fl. oz.) of water, approximately 16 fluid ounces of suspension will result. Each fluid ounce of this suspension will then contain half an ounce weight of phenothiazine. The dose rate of this suspension will be:—

Adults . .	1½ fl. oz. ½ oz. of the powder *or*
8-12 months . .	⅔ oz. of the powder *or* 1 fl. oz. of suspension.
4-8 months . .	⅓ oz. of the powder *or* ⅔ fl. oz. of suspension.

Small intestinal worms are much more resistant to phenothiazine than the stomach worms and a heavier dose should be used. The dose rate for these worms is as follows:—

Adults . .	1 oz. of the powder *or* 2 fl. oz. of suspension.
8-12 months . .	⅔ oz. of the powder *or* 1½ fl. oz. of suspension.
4-8 months . .	½ oz. of the powder *or* 1 fl. oz. of suspension.

The large stomach worm is a summer parasite and the risk of infestation is greatest after rain followed by dull, humid weather. It is a good plan to treat the goats about three weeks after such a period. If these conditions persist, repeat the drench at three-weekly intervals until dry or cool weather returns.

The nodule worm infests goats in spring, summer and autumn but may not show any effects until winter. Treat the does about a month before kidding to reduce the risk of the kids getting infested. Treat the kids in autumn to prevent the disease in winter. Treat all goats in the winter to prevent any carry-over of adult worms to the following spring.

The small intestinal worm is a parasite of the cooler months. Treat the kids at weaning time and from then on at intervals of four to five weeks from autumn until spring feed comes away.

Stocking plays a big part in the occurrence of worm diseases. Overstocking may lead to heavy contamination of the pasture long before it may cause the best feed to be eaten out. Overgrazed areas become heavily contaminated with worm eggs and become a potent source of infestation. While there may be adequate feed in the pasture, a heavily stocked pasture will defeat any drenching plan. If the pasture is adequate, it should be subdivided and the goats moved over the paddocks so formed at weekly intervals so as to reduce the risk of infestation. This also prevents selective eating out of the better plants in the pasture and ensures its even utilisation. Adequate subdivision may seem expensive initially but will give very good results. Combined with strategic drenching, it is the only effective control for worm diseases of goats.

External Parasites

Lice (*Damalinia caprae, Damalinia limbata, Linognathus stenopsis*).—The first two are biting lice and the third is a sucking louse. They are usually found close against the skin and, if the animal is standing in the sun, will appear as small white or yellow specks. They cause a roughening of the goat's coat due to frequent rubbing in an attempt to relieve the irritation. The lice are easily spread by contact between goats, also by bedding, bags and brushes.

The goat should be dusted thoroughly with a DDT powder such as is used for dogs. BHC powders are also effective. The dusting should be repeated fortnightly with DDT or weekly with BHC until the infestation is cleared up.

Scrub Tick.—Paralysis occurs when the goa has carried a scrub tick for four days. The goa becomes sluggish, and disinclined to move. I may become paralysed and breathing may become difficult. Death is a sequel in over 50 per cent. of cases.

If anti-tick serum is not available, there is no really effective treatment. Careful nursing giving the animal adequate water and feed and keeping it warm in a shed, is the only useful measure which can be adopted.

Ringworm.—This is seen in aminals in low condition and is due to a fungus infection of the skin. The hair is destroyed at its root in a small circular area up to the size of a two shilling piece. The bare areas are usually to be found around the head and neck of the animal. Ringworm is highly infectious and readily transmissible from animal to animal and to humans.

The lesions should be painted with tincture of iodine. One or two applications should clear up each lesion, and if each new one is treated early, the infection should be quickly brought under control. Tetmosol and Zephiran are also effective in the control of ringworm.

Mrs. C. Thorogood Holds Two Kids from the 50-strong Herd of the "Marcliff" Saanen Stud at Mt. Gravatt. In addition to pasture the stock are fed protein and essential minerals twice daily. The herd's average production is 6 pints a day from each goat over a minimum lactation period of 300 days. Journalists inspected this stud on the 1960 Tour arranged by the R.N.A. and the Shell Company of Australia.

bucket and bail

Thermostats on Electric Dairy Water Heaters. Low tariff electricity charges for water heating can be obtained provided the heater has an element which does not exceed 60 watts per gal. This upper limit, however, results in a lengthy heating period for 14 gal. capacity dairy heaters. By fitting a thermostat, the water can be preheated and held at a temperature high enough to ensure that it can be brought to boiling during milking. The thermostat is disconnected when the dairy is being prepared for milking by switching on a special "booster switch," and thus the very necessary boiling water is then available by the time milking is completed.

The cost to boil 14 gal. of water is almost the same whether a thermostat control and booster switch is used or whether the heating element is simply switched on with an ordinary wall switch. In fact the thermostat control uses a little more power, to replace the heat lost by radiation, but it saves you going to the dairy about 11 p.m. to switch the power on for the next morning's boiling water.

—J. D. ELRINGTON, Senior Dairy Adviser.

Udder Stimulation in Milking. Correct stimulation of the cow before milking has the greatest bearing on quick and complete milk let-down. The real value of this brief operation is still not fully appreciated by many dairy-farmers.

A cow's ability to milk out rapidly and completely is conditioned by the let-down process, and this is initiated by correct training and handling. In contented cows held in satisfactory sheds, a chemical hormone is injected into the bloodstream from the pituitary gland at milking time. When the hormone in the blood reaches the udder, it promotes the release of milk from the milk secreting tissues.

It has long been recognised that unless this milk let-down mechanism functions fully, maximum production cannot be obtained from the cow. For this reason, set milking routines, prevention of excess noise, freedom from fear, and proper training for young stock are all recommended to aid milk let-down.

Reports of recent investigations in New Zealand indicate that actual physical stimulation of the udder has the greatest effect of all in getting good milk let-down.

In the New Zealand studies, one of each pair of identical twins was milked by just putting the teat cups on without stimulation. The other in each pair was given vigorous stimulation for 30 to 40 sec. before putting the cups on. In a lactation, one of the cows that was stimulated gave 36 per cent. more butterfat than her unstimulated twin. The average difference in favour of the stimulated animals was 18 per cent. more butterfat.

Trials have been commenced in the Ipswich district, using special equipment, to investigate the factors affecting individual levels of production and the rate of milking. This long-term investigation will include an examination of the influence of the milking machine as well as stimulation on milk yields. If possible, cow family variations will also be examined.

—E. B. RICE, Director of Dairying.

Brucellosis-Tested Swine Herds

(As at 1st November, 1960)

Berkshire

Bernoth, B., Wyreema
Clarke, E. J., "Kaloon", Mt. Alford, via Boonah
Cochrane, S., "Stanroy", Felton
Cook, F. R. J., "Astonvilla", Middle Creek, Pomona
Crawley, R. A., Rockthorpe, Linthorpe
Edwards, C. E., "Spring Valley" Stud, Kingaroy
Farm Home For Boys, Westbrook
Fletcher, A. C., "Myola" Stud, Jimbour
French, A., "Wilson Park", Pittsworth
H. M. State Farm, Numinbah
H. M. State Farm, "Palen" Stud, Palen Creek
Handley, J. L., "Meadow Vale", Lockyer
Handley, G. R., "Locklyn" Stud, Lockyer
James, I. M. (Mrs.), "Kenmore" Stud, Cambooya
Kath, E. E., "Topcamp", via Toowoomba
Kimber, E. R., Block 11, Mundubbera
Law, D. T., "Rossvill" Stud, Aspley
Lees, J. C., "Bridge View" Stud, Yandina
Ludwig & Sons, A. R., "Beau View" Stud, Beaudesert
O'Brien & Hickey, J., "Kildurham" Stud, Jandowae East
Orange, L. P., "Eula", Flagstone Creek
Pfrunder, P. L., Pozieres
Potter, A. J., Ascot, via Greenmount
Q.A.H.S. & College, Lawes
Regional Experimental Station, Hermitage
Rosenberger, N., "Nevrose", Wyreema
Rosenblatt, G., Rosevilla, Biloela
Schellback, B. A., "Redvilla" Stud, Kingaroy
Smyth, E. F., "Grandmere" Stud, Manyung, Murgon
Stark, H. L., "Florida" Stud, Kalbar
Traves, G., "Wynwood" Stud, Oakey
Weier, V. F., "La Crescent", Clifton
Wolski, A., "Carramana", Warra
Young (Jnr.), W., Kybong, via Gympie

Large White

Assenbruck, C., Mundubbera
Barron Bros., "Chiltern Hill", Cooyar
Bell & Son, E. J., "Dorne", Chinchilla
Behm, A. M., "Aleun", Wondai
Butcher, Dr. B. J. & Parnwell, A. J. Plunkett Rd., via Tamborine
Clark, L. D., Greens Creek, Gympie
Coller, R. H., "Relloc", Tallegalla, via Rosewood
Cook, F. R. J., "Astonvilla", Middle Creek, Pomona
Dower, R. J. & E, A., "Dowlea", Tingoora
Duncan, C. P., "Colley", Flagstone Creek
Fowler, S., "Kenstan", Pittsworth
Franke, H. J. and Son, "Delvue" Stud, Cawdor
Garawin Stud Farm Pty. Ltd., Samford
Gibbons, A. E. H., Mt. Glorious
Gibson, H., "Thistleton" Stud, Maleny
H. M. State Farm, Numinbah
Hall, M., "Milena" Stud, D'Aguilar
Heading, J. A., "Highfields", Murgon
Hickson, K. L., "Warra", Calliope
Hoey, T. W. & S. J., Mirridong Farm, Upper Forest Springs, MS74 Clifton
Horton, C. J., "Mannuem Brae" Stud, Mannuem, Kingaroy
Hutton, G., "Grajea" Stud, Toowoomba
Jensen, S., Rosevale, via Rosewood
Jones, K. B., "Cefn" Stud, Clifton
Kahler, J. & S., "Karajoy", East Nanango
Kanowski, A., "Exton", Pechey
Kennard, R. B., "Collar" Stud, Warwick
Larsen, H. L., "Oakway" Stud, Kingaroy
Law, D. T., "Rossvill" Stud, Aspley
Lees, J. C., "Bridge View", Yandina
Lobegeiger, L. C., "Bremer Valley" Stud, Moorang, via Rosewood
Mack, A. J., Mundubbera
"Marcliff" Stud, Wecker Rd., Mt. Gravatt
Neilsen, L. R., "Sunny Hill," Ascot, via Greenmount
Neilsen, A. R., Ascot, via Greenmount
Palmer, V. P. & Son, "Remlap", Greenmount
Pampling, G., Watch Box Rd., Goomeri
Port Curtis Co-operative Dairy Association Ltd., Stud Piggery, Biloela
Postle, R., "Yaralla" Stud, Pittsworth
Potter, N. R., "Actonvale", Wellcamp
Powell, R. S., "Kybong", Gympie
Q.A.H.S. & College, Lawes
Radel, V. V., Coalstoun Lakes
Radel, R. M., "Turua", Coalstoun Lakes
Regional Experiment Station, Biloela
Regional Experiment Station, Kairi
Robinson, O. R. & O. J., "Linvale", Argoon, Biloela
Rosenblatt, G., Rosevilla, Biloela
Skyring, G. I., "Bellwood" Stud, via Goomeri
Stanton, H. R., "Lanherne" Stud, Tansey, via Pomona
Stehn, L. W., "Hodgson Vale", via Toowoomba
Stewart, L., "Ban-Nookoo", Mulgowie, via Laidley
Stumer, K. F., French's Creek, Boonah
Thomas & Sons, "Rosevale", Laravale
Wharton, C. A., "Central Burnett" Stud, Gayndah
Wieland, L. C. & E., Lower Cressbrook, Toogoolawah
Zahnow, W., Rosevale, via Rosewood

Tamworth

Armstrong, H. J., "Alhambra", Crownthorpe, Murgon
Booth, J. D., Swan Creek, Warwick
Campbell, P. V., "Lawnhill" Stud, Lamington
Fletcher, A. C., "Myola" Stud, Jimbour
Herbst, L., "Hillbanside", Bahr Scrub, Beenleigh
Kanowski, S. E., "Miecho", Pinelands
Potter, N. R., "Actonvale" Stud, Wellcamp
Regional Experimental Station, Kairi
Salvation Army Training Home For Boys, "Canaan" Stud, Riverview
Skerman, D. F. L., "Waverley", Kaimkillenbun
Stephen, T., "Withcott" Stud, Helidon
Wieland, L. C. & E., Lower Cressbrook, Toogoolawah

Wessex Saddleback

Ashwell, J., "Green Hill", Felton South
Cooper, G. J., Neumgua
Douglas, W., "Greylight" Stud, Goombungee
Dunlop, J. B., "Kunawyn", Acacia Rd., Kuraby
Kingsford, D., "San Antone", Toowoomba
Kruger & Sons, "Greyhurst" Stud, Goombungee
Lau, D. E., "Homevale", Goombungee
Law, D. T., "Rossvill" Stud, Aspley
Mack, A. J., Mundubbera
Scott, A., Wanstead Stud, Grantham
Smith, C. R., "Belton Park", Nara

Landrace

Ashwell, J., "Greenhill", Felton South
Behm, A. M., "Aleun", Wondai
Crawford, G. L., "Glenvillan", Manneum
Crothers, B. M., "Booligar", Clifton
Dower, R. J. & E. A., "Dowlea", Tingoora
Duncan, C. P., "Colley", Flagstone Creek
Fowler, K. P., "Northlea", Coalstoun Lakes
Franke, H. J. & Son, "Delvue", Cawdor
Garrawin Stud Farm Pty. Ltd., Samford
Grayson, D. G., Killarney
Itzstein, R. A., "Hyde Park", Gooroolba, Gayndah Line
Jensen, A. P., & Grace, V. S., Theodore
Jones, K. B., "Cefn", Clifton
Kajewski, W. & Son, Glenroy, Glencoe
Kath, E. E., "Topcamp", via Toowoomba
Kingsford, D., "San Antone", Toowoomba
Law, D. J., Rossville Stud, Aspley
Lusk, P. B. and I., Westbrook
"Marcliff" Stud, Wecker Rd., Mt. Gravatt
Neilsen, A. R., Ascot, via Greenmount
Neilsen, L. R., "Sunny Hill", Ascot, via Greenmount
Orange, L. P., "Eula", Flagstone Creek
Palmer, V. P. & Son, "Remlap", Greenmount
Radel, R. M. "Turua", Coalstoun Lakes
Semgreen, A. L. & D. J., "Tecoma", Kingaroy
Stehn, L. W., "Hodgson Vale", via Toowoomba
Stummer, K. F., French's Creek, Boonah

Large Black

Pointon, E., Goomburra

Plate 1: Wallan Creek at Bollon.

A Thumbnail Sketch Of Queensland's Rural Industries

By C. W. WINDERS, Officer-in-Charge, Information Services.

To the newcomer to Queensland, there are two outstanding features of its primary production. One is the diversity of crop and livestock production. The other is the vast area of fertile land that remains to be developed.

There is hardly a commercial crop, agricultural or horticultural, that cannot be grown somewhere in the State. The range of crops reflects the widely different climatic conditions of various parts of the State. This is to be expected in a region that stretches over 1,500 miles from north to south and extends up to 900 miles from the seaboard.

There are also striking contrasts due mainly to differences in elevation. Thus apples are grown on a large scale within a hundred miles of sugar-cane fields.

A similar diversity is seen in the livestock industries. Fat lamb production with British breeds goes hand in hand in some areas with the raising of fine-woolled Merino sheep. Again, a substantial dairying industry using largely European breeds is conducted on subtropical lines about 400 miles within the tropics.

So much for the diversity of the rural scene. The other surprising feature—the relative extent of intensive farming and extensive land use—calls for some comment.

Practically the whole of the land suitable for primary production is being used either for crop or livestock production or for forestry purposes. But a great deal of the occupied land is under-developed.

In these millions and millions of acres of under-developed land lies a vast potential for expansion of primary production.

In terms of land, present knowledge of the capacity of the soils suggests that there are probably 50 million acres of land that could be cultivated. Some millions of acres are suited to intensive cropping under existing systems of agriculture.

In addition, some success with crop production, associated with livestock production, could be predicted for much of the country now devoted purely to extensive grazing with sheep or beef cattle.

Another feature of the primary industries that is worth mention is the extent to which modern practices are adopted. For example, there are nearly 50,000 milking machine stands, some 18,000 shearing machine stands, 50,000 tractors and 12,000 grain drills on the 43,000 rural holdings. Giant land-clearing and earth-moving equipment is speeding land development in many areas. Aerial spraying and dusting of crops is a regular practice in some industries.

THE LIVESTOCK INDUSTRIES

Pride of place among the livestock industries is occupied by wool-growing, which has made possible the economic utilisation of an immense belt of semi-arid country in western Queensland. The average number of sheep approaches 20 million.

The bulk of the eastern and northern country is occupied by beef cattle properties. Hundreds of thousands of square miles of eucalypt forest have been rendered productive by thinning out trees and encouraging native pastures for beef cattle. Some six million beef cattle are run.

Dairying is a much more intensive industry than either wool production or beef cattle raising. It is conducted mainly within about 100 miles of the eastern seaboard on some 20,000 commercial dairy farms. The dairy cattle population is about 1⅓ million.

Pig raising is associated very largely with dairying, particularly on farms on which skim-milk is retained.

There are approximately 750 commercial poultry flocks in Queensland, with eggs as the main output. The broiler industry is now developing fairly fast.

Sheep

Wool production is carried out for the most part on native pastures in a belt of mid-western to far-western country up to 300 miles wide extending from the southern border 700 miles towards the Gulf of Carpentaria. Much of it is

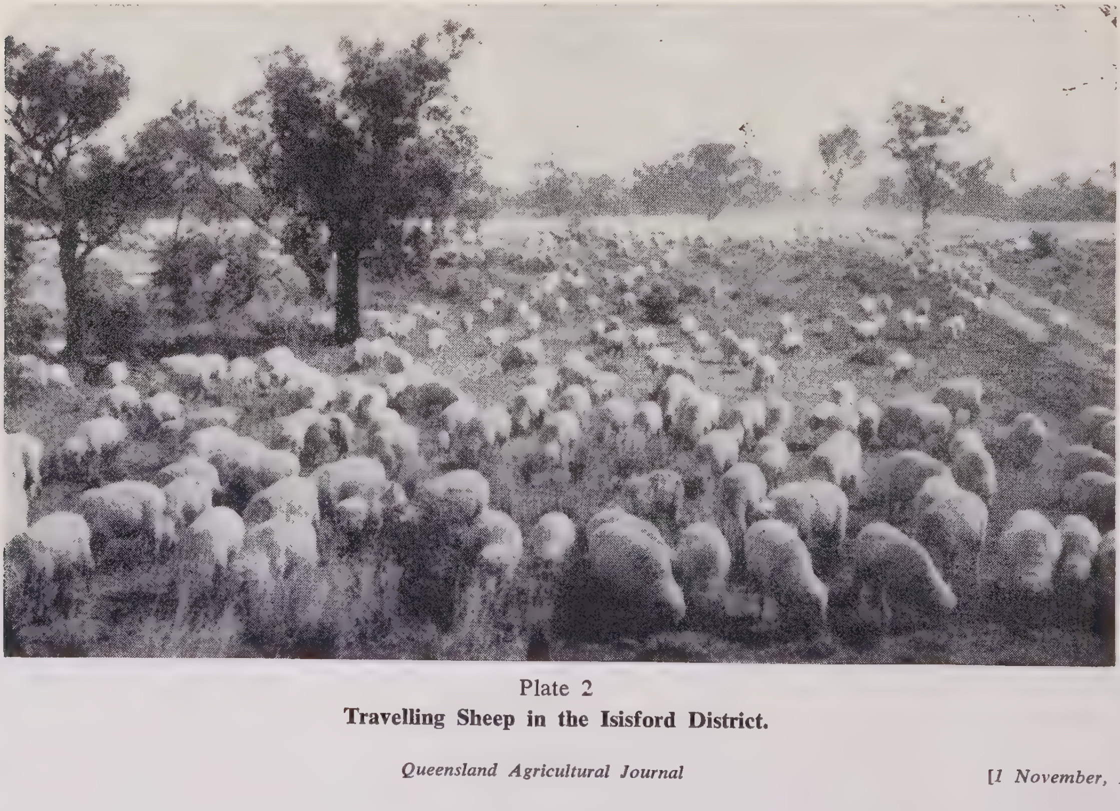


Plate 2

Travelling Sheep in the Isisford District.

semi-arid country and subject to periodical droughts, but grows excellent Merino wool.

The carrying capacity of the sheep country is fairly low, and the safe minimum areas estimated for good quality lands with adequate artesian water range from 20,000 to 35,000 acres in the north, through 15,000 to 25,000 acres in central Queensland, to 10,000 acres in the south. These areas provide for carrying capacities of 3,000 to 8,000 sheep.

Over 70 per cent. of flocks have more than 5,000 sheep and only about 8 per cent. have under 2,000 sheep. Among the smaller flocks are a number run in conjunction with grain cropping in the south-eastern agricultural areas, particularly the Darling Downs.

Though the main sheep areas are far from the seaboard cities, they are served by a number of towns with electricity, water supply, public swimming baths and other amenities. The sheep holdings themselves have in most cases to provide their own lighting and power, as electricity reticulation in the western areas does not extend far from the towns. Most properties have a telephone service and those that are not so served often have pedal radio transceivers.

State primary schools are established in many centres. Those children who are unable to attend these schools are educated by correspondence by the State Primary Correspondence School. There are State secondary schools in a number of western towns, and hostels for students are available in some centres.

The wool industry is in general in a sound financial position. Its future depends to some extent on the demand for wool as compared with substitutes. The Australian wool industry is spending a large sum annually in research and promotion to combat the competition of substitute fibres.

So far as the potential for expansion of wool growing in Queensland is concerned, it may be said that this lies in two directions.

First, the policy of Queensland Governments has been closer settlement of Crown lands. This has been effected most generally in the sheep areas. As leases of large properties expire, portions are excised for subdivision into living areas for new settlers. This process is continuing and is leading to more intensive use of sheep country.

Second, the clearing and development of timbered country within or adjacent to the main sheep belt offers considerable scope for expansion. This development has been hampered in the past by the high cost of destroying the fairly thick forests, but the use of modern land-clearing equipment and aerial spraying with herbicides is accelerating the land improvement programme.

Beef Industry

The eastern and northern beef cattle regions have an annual rainfall higher than that of the sheep country and are less subject to droughts. They do nevertheless experience extended dry periods and in addition the quality of the grazing is variable throughout the year.

To the west of the sheep belt is an area of beef cattle country which has a low rainfall but which benefits from heavy rains at the headwaters of the streams that flow through it in thousands of channels. The properties here are very large and in some cases act as seasonal fattening properties for store cattle from associated properties to the north.

The bulk of the eastern and northern cattle country is tropical open forest, interrupted by some open grassland and by denser forest formations. The main pasturage is of native grasses encouraged on most properties by partial destruction of trees.

The industry is based largely on the Shorthorn and Hereford breeds, with Aberdeen-Angus, Poll Shorthorn and Poll Hereford also important. Within recent years there has been a significant use of Brahman blood either in the purebred Santa Gertrudis or in crosses. The infusion of Brahman blood in breeds in the tropics has been shown to increase growth rate and is claimed to improve resistance to ticks.

Cattle raising is carried on mainly on an extensive scale, particularly in the breeding areas of the north, from which store cattle are sent in large numbers to more favoured regions for fattening. Small-scale cattle fattening is usually associated with mixed farms.

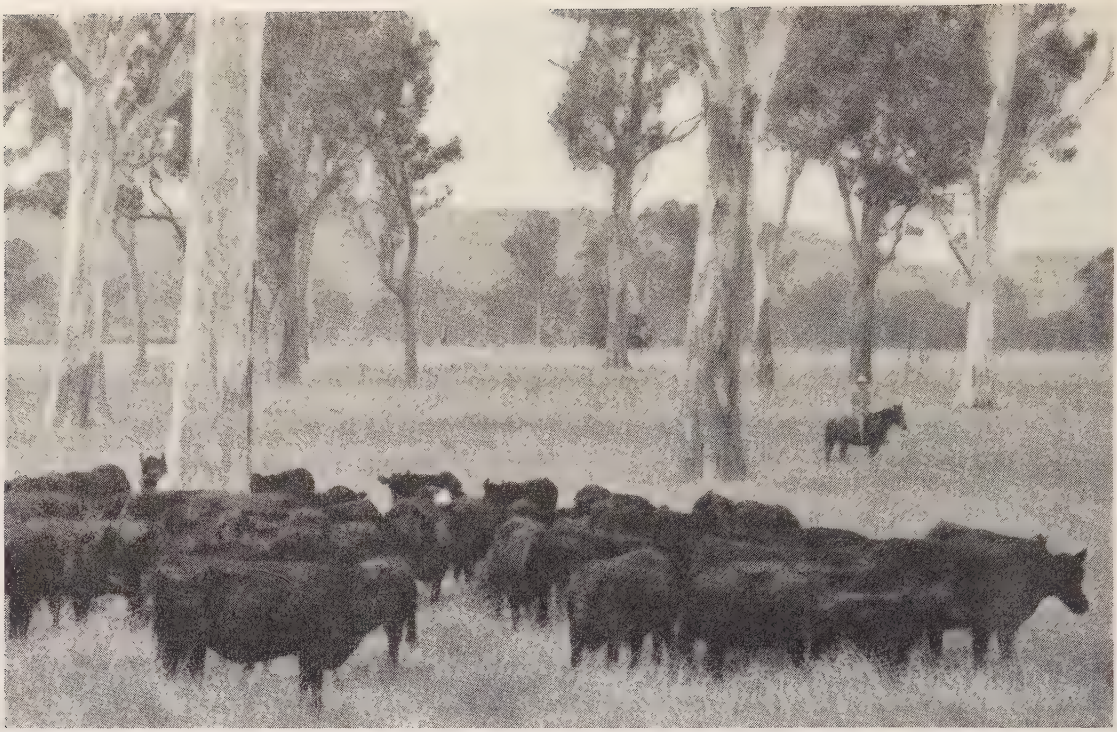


Plate 3

Beef Cattle at Beaudesert.

Much of the beef cattle country is rather sparsely settled, and the same remarks apply to amenities and educational facilities as are made for the sheep districts.

In recent years the industry has advanced, as prices in general have returned sufficient to enable property improvements such as subdivision and the provision of adequate watering facilities to be undertaken. Watering points are of particular importance in obtaining full utilisation of pasture. These usually take the form of bores, wells or earthen tanks. The cattle country in general is not underlain by artesian water and underground supplies must be lifted by windmills or pumps.

A good deal of the better class beef fattening country is held in freehold and little subdivision of these holdings is proceeding. There is limited subdivision of Crown land for closer settlement in the beef cattle regions. A good deal of development for beef cattle raising is envisaged for some millions of acres of brigalow forest country.

The prospects for the beef industry are quite good, as a satisfactory agreement for the disposal of surplus beef is operating and the local market is profitable and increasing. There is a trend towards improved fattening techniques by pasture improvement and fodder crop production and this will create opportunities for newcomers to enter the industry.

Dairying

Dairying is conducted commercially on almost 20,000 farms, many of them devoted solely to dairying.

Three main regions may be recognized—(1) the coastal region, consisting of an interrupted strip of dairying districts in the coastal plain and adjoining highlands between the southern border and the Daintree River, north of Cairns; (2) the sub-coastal region, comprising sections of the central and upper portions of the eastern river basins, mainly south of the Tropic of Capricorn; and (3) the Darling Downs (in the south-east) and a narrow westward extension

Plate 4

Dairy Cattle near Cooroy.

The type of dairying practised is substantially different in each region.

In the coastal and adjacent areas, most farms carrying livestock are devoted almost wholly to dairying and little cash cropping or growing of fodder crops is carried on. Dependence is placed almost entirely on permanent sown and/or native pastures.

In the sub-coastal region, the proportion of good cultivable land is much higher than on the coast. Here, dairying is on many farms combined with cash cropping. Permanent pasture, including a good deal of sown pasture, is less reliable than on the coast.

The Darling Downs generally are poorly supplied with good permanent pasture, either native or sown, but this disability is balanced by the fertility of the soils and the practicability of providing supplementary grazing on fodder crops in most years. About one-third of the State's dairy farms are situated on the Darling Downs, and because of the widespread use of grazing crops, production per cow is substantially higher than elsewhere in Queensland.

An increasing, though still very small, proportion of the dairy farm output is coming from irrigated pastures and fodder crops.

The main breeds of dairy cattle are Australian Illawarra Shorthorn, Jersey, Guernsey and Friesian, with the first two predominating.

The cattle tick is troublesome in the coastal and sub-coastal areas, necessitating regular dipping or spraying.

Queensland's dairy production is largely for buttermaking. Butter factories are distributed throughout the dairying districts. Cheese production is concentrated largely on the Darling Downs. Some dairy factories process milk for other purposes. The quantity of milk pasteurised is rising rapidly and numerous pasteurisation plants are operating throughout the State.

Because of the fairly close settlement of the dairying districts, few farms are very far distant from a progressive town. Primary schools are conveniently situated for most children, and secondary schools are also readily accessible in most areas. Electricity reticulation is extending through the dairying districts.

The dairying industry depends to a considerable extent on exports of butter. Within recent years, prices have not been particularly satisfactory and despite a Commonwealth subsidy on butter consumed in Australia and on a percentage of export butter, the industry generally has not been in a flourishing condition. Ways and means of remedying this position are being sought, and there is confidence in the ability of the industry to recover the ground it has lost.

AGRICULTURE

The agriculture of Queensland is often thought of in terms of the sugar industry, but while sugar-cane is the State's most valuable field product, other crops are of considerable and increasing importance.

Though most of the State has an average annual rainfall of over 15 in., agriculture is not carried on to a great extent beyond the 25 in. line. Rainfall variability, even in the coastal districts, is high, and this, coupled with high evaporation during the summer months, in which most of the rain falls, limits the effectiveness of the total rainfall experienced.

Most of the land cultivated (some 3 million acres) is situated south of the tropic. The Darling Downs constitutes by far the largest developed agricultural area in the State, the annual cropping being about one-third of the total.

Narrow tongues of farming land extend westwards from the Darling Downs, but the remainder of the land used for agriculture in the south-east lies nearer to the coast, east of the Great Dividing Range. Here a wide variety of crops are produced in the basins of the eastern rivers.

The eastern coastal districts, in interrupted stretches along a coastline of 1,200 miles, produce the State's sugar-cane and the bulk of the commercial tropical and sub-tropical fruits. In the Cairns hinterland are the maize-growing district of the Atherton Tableland and the Mareeba tobacco area.

A large proportion of the State's arable land is held in freehold. The remainder is held under lease from the Crown.

Sugar-cane

The sugar industry in its early days was conducted largely on the plantation system, but this has almost disappeared and small growers numbering about 7,000 now produce practically all the sugar-cane. This is crushed at 31 mills, 14 of them co-operatives.

In the main, the crops are grown under natura rainfall, but some irrigation is practised in th drier cane districts.

By constant research and by farm mechanisation, the Queensland sugar industry has remaine one of the most efficient in the world. At th same time, it is the only cane sugar producin country which does not employ coloured labour

The sugar industry is intensively organised. A land assignment system operates in order t effect some measure of crop control and stabilisation. Under this system, each farm is assigne a maximum acreage that it may harvest each year. Sugar-cane farms are assigned to particula mills. Cane is purchased on analysis and check chemists are placed in every mill by the Centra Sugar Cane Prices Board.

The main function of this Board is to act in a judicial capacity in making all cane price awards and to control all sugar-cane land assignments. The Sugar Board attends to the marketing of the sugar and advises on the final price to be paid after all sugar has been disposed of.

The acreage at present assigned for cane growing for milling is more than adequate to fil domestic requirements and quotas allotted t Australia under the International Sugar Agreement, in which is incorporated the Commonwealth Sugar Agreement. Thus expansion is no warranted at the present time.

The sugar industry is particularly progressiv in cane production, milling and marketing.

On the production side, the Bureau of Suga Experiment Stations is constantly working o varietal improvement, cultural methods and pes and disease control. The Queensland Cane Growers' Organisation is active in promoting mechanical harvesting and loading of cane, which it believes to be the main avenue now open fo reducing the cost of production.

Research on milling problems is proceeding all the time. The mills represent a very large capital investment. Besides having their own transport systems and in the main generating their own electricity, they possess efficient workshops and provide housing for their staff.

To improve the marketing of the raw sugar bulk handling facilities are being established a the main export centres.

The intensive nature of the sugar industry and its magnitude have resulted in the establishment and growth of numerous prosperous towns and cities along the eastern seaboard. Cane farmers consequently enjoy all the facilities that are available under these conditions.

Grain Crops

Wheat is grown on some 700,000 acres and ranks next to sugar-cane in monetary value. The climatic hazards to growing wheat in a summer rainfall area have been countered in various ways. Cropping systems are practised which permit the retention of summer rain for the ensuring wheat crop. The breeding of drought-resistant varieties has also substantially assisted. Finally, mechanisation of farm operations enables large acreages to be prepared quickly and to be sown on isolated planting rains, and at harvest time in the early summer reduces the risk of spoilage of ripe grain due to seasonal storms.

There are nearly 6,000 wheat growers, and a large proportion of the crop comes from plantings of between 200 and 2,000 acres. The crop is grown mainly on the Darling Downs but is extending into new country each season. The total area planted fluctuates according to market prospects. Marketing is effected through the Australian Wheat Board and its agent, the State Wheat Board. The milling quality of Queensland's wheat is high and much is disposed of at a premium price.

Barley has come into prominence in recent years as an alternative to wheat. Good disposals have been made on overseas markets. Further expansion will depend on market prospects.

Apart from the Atherton Tableland, where annual plantings of some 25,000 acres are concentrated in a very small region, maize growing is mainly a mixed-farming activity of the south-eastern agricultural areas. It has given way to grain sorghum in much of the country marginal for maize. Grain sorghum, which did not attain prominence until the 1940's, has overtaken maize as the most important summer grain.

Tobacco

Tobacco production figures very largely in the forward planning of agriculture in Queensland. Optimism for the future of the industry is based largely on the provision of more irrigation facilities and on the large domestic demand for tobacco.

About three-quarters of the acreage devoted to tobacco is situated in the north, mainly west of Cairns. Another important northern area is the Burdekin River. In the southern part of the

Plate 5

Headers Harvesting Wheat With Bulk Equipment on the Darling Downs.

State, most of the tobacco crop is grown under irrigation on the Dumaresq River system in the near south-west.

Tobacco in Queensland is a small-farm crop, the average grower cultivating about 5-10 acres and curing his own leaf. All tobacco leaf produced is sold through the Tobacco Leaf Marketing Board.

Fibre and Oil Crops

The only fibre crop that has achieved prominence is cotton. The industry declined during World War 2 but is regaining its pre-war position as production conditions improve.

Better cultural methods are promising higher returns now, and irrigation is also becoming more generally available. The harvesting position has been improved by the importation of mechanical pickers.

The industry has a sound price structure i the form of a guaranteed minimum price fo satisfactory grades of seed cotton and this i encouraging farmers to plant the crop.

Linseed has become an important oilseed crop in recent years and is grown quite extensivel on grain farms, especially on the Darling Downs There are satisfactory local outlets for the seed

The peanut has been a source of considerable wealth to the South Burnett district, where annual plantings have been as high as 40,00 acres. There is some production in other areas also. This crop is disposed of as kernels fo the confectionery trade or for oil extraction There is now considerable competition betwee peanut oil and imported olive oil, but the industry, which is well organised, is taking vigorous steps to maintain its position.

Plate 6

Harvesting Pineapples on Mr. Jack Gowen's Farm, Glasshouse.

Fruits and Vegetables

The most important of the fruit crops is the pineapple, which is grown mainly within 100 miles of Brisbane. Apart from a few large plantations, the crop is grown on small farms, often as a sideline to other enterprises. There are large areas on the north-eastern coast suitable for pineapple production, but distance from markets has retarded the development of the industry there. There is some production on the central coast.

The economy of the pineapple industry has been based largely on canned fruit and canned or bottled juice. Owing to heavy production in recent years, a large proportion of the canned pineapples has had to be disposed of on overseas markets. Increasing competition from other suppliers, together with tariff changes unfavourable to Australia, has made overseas markets less remunerative, and returns to growers have fallen. Sales promotion is expected to keep export sales at a reasonable level.

Banana growing is conducted on over 4,000 acres and is in general a remunerative enterprise. The industry is expected to advance as transport and holding methods are improved by scientific research.

Citrus fruits are grown commercially on over 4,000 acres. The main production centres are lower North Coast and Gayndah, on the Burnett River. In the latter district, production is confined to irrigated land. This industry is in a satisfactory position, but no great expansion is warranted at present.

Papaws, mangoes and custard apples are tropical or subtropical fruits of lesser importance. Papaws, apart from fresh fruit sales, are disposed of to canneries largely for inclusion in tropical fruit salad packs. The main production is confined to a few districts, mainly close to Brisbane.

Apples, grown on some 7,000 acres on a plateau in the south-east, are the chief deciduous fruit crop. While most of the deciduous fruits are marketed locally, there is some export of apples to the United Kingdom and the Far East.

Queensland plants about half the Australian acreage of pumpkins and roughly one-third of the tomato, bean and onion crops. Large tonnages of pumpkins, tomatoes and beans are sent to other States. Potatoes are grown only for consumption within the State. Little canning or dehydration of vegetables is carried out in Queensland, production being almost wholly for the fresh vegetable markets.

The small-crop industry is important around the larger centres of population, and many migrants with limited capital have taken up vegetable growing.

THE OUTLOOK

The many primary industries of Queensland could be expanded or intensified to a considerable degree. There is a vast area of underdeveloped land, and methods for developing much of it are now known. There is, in fact, a good deal of expansion of crop-growing and intensification of stock-raising going on continuously.

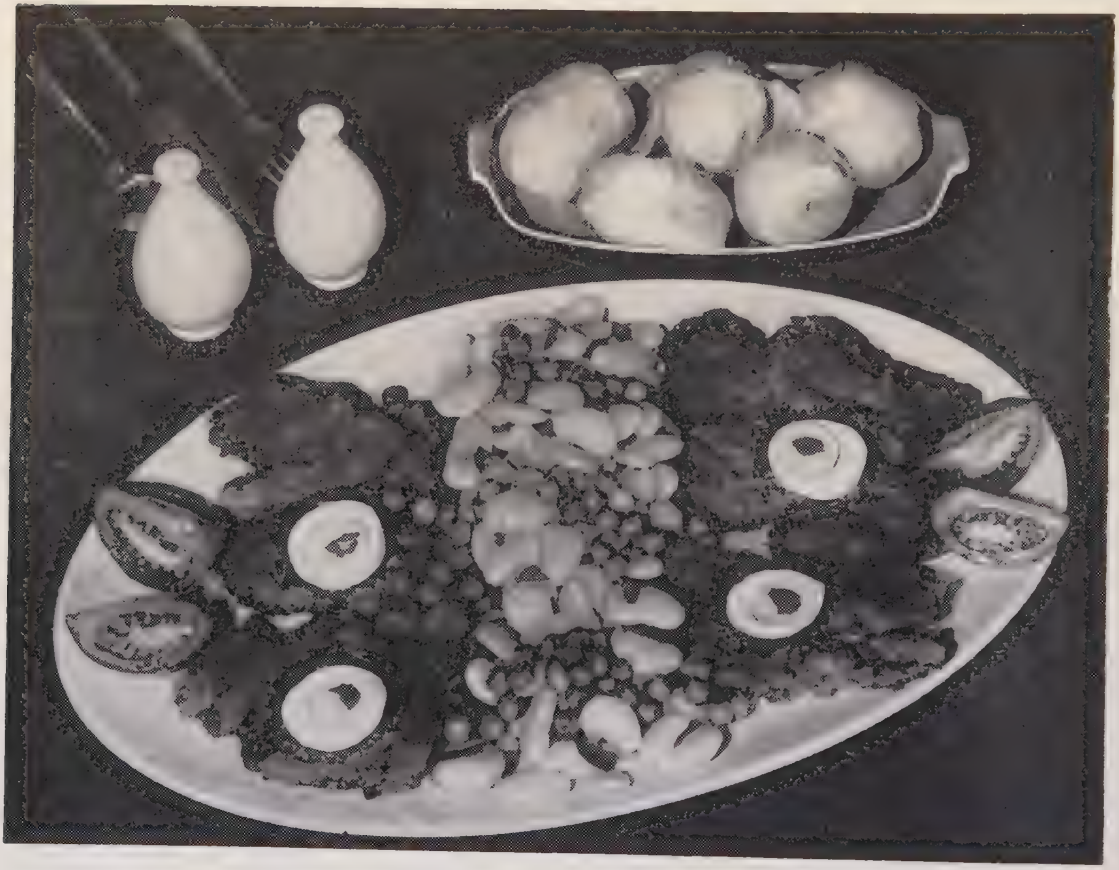
There is a very large capital investment in the primary industries, but new investment is not sufficient to allow the best use to be made of improved properties, let alone promote the development of new enterprises. Primary production as much as secondary industry offers a big field for investment.

The rate of development will depend also on market prospects for primary products. The Australian market is increasing rapidly as the population increases and will demand more and more of the commodities which Queensland is particularly suited to supply. The export market is in these times a variable one, but Queensland has firm outlets for many of its products and is continually opening up new markets for particular commodities.

There is every reason to predict an era of expansion in a State which more than any other has the potential for expansion.

For Country Cooks

Notes from the JUDITH MAY TEST KITCHE
directed by RUBY BORROWDALE for
The Butter Marketing Board



Veal, Continental Style

Veal is always a happy choice for the housewife when planning the main meal of the day. It is a lean meat giving a very small percentage of waste in cooking and has the advantage of combining tender quality with a delicate flavour. Veal joints are always popular and are particularly suitable for roasting. Cutlets and fillets are frypan favourites the world over.

WIENER SCHNITZEL (photographed on this page)

Six veal fillets or veal steaks cut from top of leg, 1½ teaspoons salt, ½ cup plain flour, 1 teaspoon dry mustard, 1 slightly-beaten egg, 1 tablespoon water, 1 cup fine dry breadcrumbs or cereal flake crumbs.

Flatten veal with meat pounder; rub with salt and then mustard, and coat evenly with flour, dip in egg mixed with water and then coat evenly with crumbs. Fry in hot deep fat or oil (370 to 380 deg. F.) until richly browned and cooked through. Or line a shallow baking pan with aluminium foil and brush the foil with melted butter or ghee, place crumbed veal fillets on the foil and sprinkle generously with melted butter or ghee and bake in moderate oven (350 deg. F.) about 45 minutes. No other cooking fat is necessary for this method and it is an easier way of preparing a larger quantity.

When veal is cooked, sprinkle with paprika. Serve with new potatoes boiled in their jackets, buttered green peas and lima beans. Garnish with sliced hard-cooked egg, tomato wedges and parsley.

SAVOURY VEAL ROLLS

Four trimmed veal cutlets, 2 tablespoons butter or ghee, ½ lb. finely-minced beef steak, ½ cup soft white breadcrumbs, ¼ teaspoon mixed dried herbs, ¼ cup milk, 1 cup chopped onion, 1 small can tomato soup, 1 cup of water, ½ bay leaf, dash of allspice.

Melt butter or ghee in frypan and fry the veal cutlets until lightly browned on both sides but not completely cooked. Remove cutlets from the pan and allow to cool. Mix the minced meat, crumbs, herbs and milk together, divide into four equal portions. Cover each veal cutlet with one-quarter of the prepared meat mixture, pressing it neatly into shape. Dust lightly with flour, pepper and salt and brown on all sides in the pan, then sprinkle with the chopped onion; combine soup, water, bay leaf and allspice and pour into pan. Cover with lid and simmer about 40 min.

Serve with freshly cooked rice and a crisp cabbage salad. Makes four servings.

VEAL PAPRIKA

Two rashers of bacon, 1½ lb. veal steak, plain flour, ½ cup chopped onion, 1 teaspoon paprika, ½ teaspoon salt, 1 cup sour cream, ½ cup tomato sauce, 1 tablespoon butter or ghee.

Melt butter in pan, add bacon and fry till crisp; remove from pan. Cut veal into serving-size portions and dust well with seasoned flour. Brown pieces evenly in the hot bacon fat in the pan. Add the chopped onion and sprinkle with paprika and salt. Stir in the sour cream, tomato sauce and crisp bacon. Cover pan and simmer about 30 min. Serves four to six.

Serve with plain dumplings or freshly cooked spaghetti.

CURRIED VEAL

For every four servings allow about a 3 lb. Knuckle of veal, 1 pint water, 3 tablespoons butter or ghee, ½ cup chopped onion, ½ cup chopped apple, 1 chopped red capsicum, 1 clove garlic, 2 teaspoons curry powder, 1 teaspoon salt and about 4 tablespoons cornflour.

Place veal in water and simmer until veal is tender. Remove veal from stock and add water, if necessary, to make 2½ cups stock. Cut veal into neat pieces. Meal the butter or ghee in a large enamel-lined saucepan, add the onion, garlic, apple and capsicum. Cook over low heat, stirring occasionally until vegetables are tender but not browned. Mix the curry powder, salt and cornflour with a little of the stock to a smooth paste. Add remaining stock to vegetables, and when heated stir in the cornflour mixture, cook, stirring until a thick, smooth sauce is formed. Add the veal and heat thoroughly.

Serve with steamed rice.

Note: Some cooks like to add a tablespoon of sweet, spicy chutney to the curry before removing it from the stove.

GRILLED VEAL CHOPS

Select rib or loin chops cut 1 in. thick; wipe with damp cloth and brush each side with melted butter or ghee—this is necessary because veal is a lean meat. Grill under medium heat about 20 min. or until well done, turning chops when browned.

Sprinkle with salt and pepper, and serve on a hot plate with lemon butter.

Lemon Butter: Cream 2 oz. butter in a small bowl, then gradually blend in ½ teaspoon grated lemon rind and 2 teaspoons lemon juice. Store in a covered dish until required. At serving time place a small cube of the lemon butter on each grilled chop and allow it to melt over the chop to form a sauce.

BRAISED VEAL

Select 1½ to 2 lb. veal cut from top of leg or use veal chops cut about 1 in. thick; wipe and dredge with seasoned flour. Melt ¼ cup butter or ghee in heavy pan and fry the steak or chops on both sides until richly browned, turning frequently. Add 1 cup hot water, stock or tomato juice, or 1 cup sour cream; cover pan and simmer about 1 hour, turn meat once or twice. Serve on a hot dish with gravy from pan. If necessary thicken gravy with cornflour, adding more liquid if necessary to make sufficient gravy. Serve with freshly boiled rice and a green vegetable.

VEAL CHOPS WITH MADEIRA AND MUSHROOMS

Six veal chops with kidneys, 4 white onions, ½ lb. fresh mushrooms, 2 outside stalks celery, 5 tablespoons butter, plain flour, pinch thyme, pinch marjoram, 1 tablespoon chopped parsley, 1 cup veal stock, 1 cup sour cream, 1 tablespoon canned tomato paste, salt, paprika, ½ cup Madeira (wine) and 2 tablespoons brandy.

Peel and slice onions and mushrooms thinly; remove strings from back of celery and cut into small pieces. Melt 4 tablespoons of the butter in a small enamel-lined saucepan and add these vegetables. Cook and stir over low heat until tender. Remove from stove and stir in a rounded tablespoon plain flour till smooth. Gradually add the stock, stirring to blend; return to stove and cook, stirring to make a smooth, thick sauce. Remove from heat again and gradually add the sour cream, herbs, seasonings, and tomato paste. Bring to boil again and then add the ½ cup Madeira. Cover saucepan and simmer while preparing the chops.

Dust the veal chops evenly on both sides with plain flour and fry in the tablespoon hot butter until nicely browned on both sides. When the chops are browned, pour 2 tablespoons brandy over them, set it alight and let it burn for a few seconds. Then extinguish the flames by pouring the onion-mushroom-wine sauce over them. Cover the pan and cook over very low heat about 30 min.—fast cooking will spoil the flavour of this dish. Serve with freshly boiled rice, spaghetti or mashed potatoes. Add a garnish of green peas and lemon wedges.

On the Right is Edmund Bohl, of Hermann, Missouri, U.S.A., 21-year-old 4H Club Member, Who Is Visiting Queensland under the Sponsorship of Caltex Oil. He is talking to (l. to r.) Ted Lewis and Gwen Brider (Queensland Junior Farmers) and Mr. Ken Graham, Assistant Manager for Queensland of the Caltex Oil Co.

AUSTRALIAN WOOL FASHIONS

Grey Wool Sheath with Deep Plunging V Neckline of Snow White Mouton. The fitted coat is cut with classical neckline to reveal the white fur. Matching hat with high fur crown.

A Sophisticated Tunic of Fine Black Wool Dramatised With a Deep Low Back Outlined With Snow Drift Fox Fur. The slim dress is an ankle length hand pleated sheath with fine rhinestone shoulder straps.

A parade of Australian fashions in Australian fabrics made of Australian wool was staged in the Washington Hotel, London. It was the first time that an Australian fashion designer had taken his own haute couture collection overseas.

The 40 garments paraded were designed by Hall Ludlow for the Department of Trade. They were to form part of a range of 70 Australian wool fashions to be featured in the Australian Government Trade and Fashion Promotion at the Lausanne Fair (Switzerland).

The collection showed how adaptable Australian wool is to every season, and to every time of day. Mr. Ludlow visited the leading Australian woollen mills and chose their most beautiful, adaptable and varied pure wool. He chose textures and colours to complement a complete collection, and decided on designs as he handled, weighed and draped each new fabric.

This collection is not solely winter fashion, but particularly shows how adaptable the Australian wools are to every season.

Knitwear—finely and dramatically styled—features wool fur trimming. Hand-sewn loops of wool are trimmed and brushed to great effect. Australian fur broadtail and white mouton and also snow drift fox have been used to accentuate style.

Matching hats, in wool were devised to finish each ensemble.

The evening and cocktail gowns were styled of fabulous colour and contrast. A white cocktail dress was embroidered with heavy clusters of scarlet wool and Australian gum flowers. It was worn with a chignon cap of the flowering gum and the ensemble was completed with a dramatic draped coat of vivid scarlet, lined with white.

A slender evening sheath was embroidered with clusters of soft gold Australian wattle. It was shown with a cleverly draped, sophisticated gold evening coat.

* * *

Bee Enthusiasts

Two Enthusiasts, Mr. N. V. Rice and his Daughter, Mary, of Wynnum West, Show No Fear of Bees when Discussing Beekeeping with Members of the R.N.A.-Shell 1960 Journalists' Tour. Mr. Rice now has 350 honey-producing hives which he consistently moves around the South Coast and Brisbane's surrounding hills to give more than 7 tons of honey a year. His principal interest, however, is breeding more than 2,000 Pure Italian Queens a year to supply commercial apiarists throughout Australia and New Guinea.

Plate 1

Grazier's Transport Photographed at a Far Western Field Day.

Does It Pay To Use A Plane On A Grazing Property?

By H. I. TOFT, Agricultural Economist.

The privately owned aeroplane has become much more prominent in recent years in the wool industry. Many graziers now have their own planes. That an aircraft is a convenient means of transport between towns is obvious. In grazing areas this is more so, due to increased distances. The aircraft can also be a very useful piece of equipment in work on the property itself. In this article it is proposed to indicate the level of costs which might be expected in owning and operating a small aircraft, and also to discuss some of the possible benefits.

Through the co-operation of a grazier running a typical property, details of which are given, an example has been obtained of the use on a property of a private aircraft. The economic analysis carried out suggests that the cost of having an aeroplane would at least be largely offset by the economic advantage of using the plane on the property. This is in addition to non-economic benefits, such as convenience, which are to be derived.

Owning and Flying Costs

The type of aircraft used on the property is a DH82—Tiger Moth. An estimate of the costs of owning and operating a Tiger Moth is shown in Table 1, with a similar estimate for the Cessna 172 in Table 2. These estimates were obtained from information supplied by commercial users of these planes.

Costs have also been separated into annual or fixed costs, and variable costs. The annual costs shown consist of depreciation, insurance, and an annual appropriation towards Certificate of Airworthiness costs. This certificate must be renewed every three years and involves maintenance work on the plane prior to issue. Under the heading, variable costs, are shown costs which vary directly with the number of hours flown. These consist of costs of fuel and oil, 100 hour checks, and engine and propeller overhauls, which are carried out about every 1,300 hours for the DH82 and every 1,000 hours for the Cessna 172.

In estimating the depreciation on an aeroplane, account has been taken of the effect of the repeated overhauls, in which parts are renewed, on the aircraft's market value. For this reason an estimate of depreciation was made by comparing the market value of the plane bought to-day in new or completely overhauled condition and its market value in 6 years' time in completely overhauled condition.

When a Tiger Moth is bought to-day for £800 it is assumed that its value in 6 years time will be between £500 and £600. A Cessna 172 bought to-day for £5,500 is assumed to be potentially worth £4,000 in 6 years' time.

The costs shown apply to that time span. This method of calculating depreciation aims at finding the actual annual loss in capital value as distinct from depreciation as allowed for taxation purposes.

The total costs each year of operating a Tiger Moth will vary according to the number of hours flown. Where the aircraft is flown 200 hours in the year the estimate is £700, for an aircraft flown 300 hours in the year the estimate is £1,000, and for a plane flown 400 hours, £1,200.

TABLE I

THE COSTS OF OWNING AND OPERATING A TIGER MOT

Annual Fixed Costs—Tiger Moth

Depreciation	£40 a year
Interest on Capital Invested—5% ..	£40 a year
*Insurance of Aircraft (Ground and taxying insurance at 32s. 6d. per cent., based on a value of £800)	£13 a year
Third Party Insurance (£10,000 cover)	£8 a year
Passenger Liability (£5,000 cover) ..	£10 a year
Allowance for Certificate of Airworthiness. (This cost could vary considerably. The cost of £92 is an estimated maximum.)	£92 a year
	£203 a year

Variable Costs—Tiger Moth

Fuel and oil (5s. a gallon for fuel; 2s. a pint for oil)	£1·90 a flying hour
Cost of 100 hour checks	£0·40 a flying hour
Cost of overhaul to engine and propeller (1,300 hour interval)	£0·25 a flying hour
	£2·55 a flying hour

* Comprehensive insurance including all flying and ground handling risks and third party insurance to £10,000 is available at 6 per cent.

Plate 2

Stock Can be Mustered on This Property Largely by Air. Note the landing ground on the top right.

Plate 3

Supplies and Mail Can Be Dropped to this Flood-Bound Station by Air.

TABLE 2

THE COSTS OF OWNING AND OPERATING A CESSNA 172

Annual Fixed Costs—Cessna 172

Depreciation	£250 a year
Interest on Capital—5%	£275 a year
Insurance of Aircraft (Ground and taxying insurance at 32s. 6d. per cent., based on the initial value of £5,500.)	£89 a year
Third Party Insurance (£10,000 cover)	£8 a year
Passenger Liability (£5,000 cover) ..	£30 a year
Allowance for Certificate of Airworthiness. (This cost is stable for the Cessna 172.)	£23 a year
	£675 a year

Variable Costs—Cessna 172

Fuel and oil (5s. a gallon for fuel ; 2s. per pint for oil)	£1·50 a flying hour
Cost of 100 hour checks	£0·22 a flying hour
Cost of overhaul to engine and propeller (1,000 hour interval) ..	£0·31 a flying hour
	£2·03 a flying hour

The estimated total annual cost of a Cessna 172 operating 200 hours a year is £1,100, that of a Cessna operating 300 hours, £1,300, and 400 hours, £1,500.

Using Aircraft to Muster Sheep

Information was obtained of the use of an aircraft—in this case a Tiger Moth—to muster sheep on the property mentioned earlier. This is a property of 41,000 acres, with a stock of 8,000 sheep including 4,000 breeding ewes. The lamb marking varies from 40 to 75 per cent. in the year. As such, it is a fairly typical property. The plane is used on this property to locate the sheep, force them into mobs and start the mobs in the required direction. The number of mobs is counted. Then after the plane returns to the landing strip, the sheep are rounded up in a jeep. This is followed by another trip in the plane to ensure the paddocks are clear.

The mustering of a paddock by this method takes one man about 1 hour in the plane for both trips, and about 4 hours in a jeep.

Previously on this property the mustering was always done on horseback. This would take three men about 6 hours in each paddock to do the first mustering, and then four men 6 hours finding the strays.

Comparing the two methods it can be seen immediately that, as expected, there is a considerable time-saving in the use of the plane. Not only has the plane an obvious edge on the horse in speed but it offers a vantage point from which the sheep are more easily seen.

The economics of the use of the plane instead of the horse depends on the value of the time saved compared with additional costs incurred in achieving the time-saving. Estimates of these extra costs and the amount of time saved follow:

(*a*) *Extra costs of Mustering by Aeroplane*

It is assumed here that the grazier already owns the aircraft and is deciding whether it is economical to use it to muster sheep. Here the annual fixed costs need not be considered.

Variable costs per flying hour of a Tiger Moth	= £2·55
Flying time for single mustering of a paddock	= 1 hour
Annual flying time mustering	= 32 hours
Annual flying costs of mustering (variable costs only)	= £82
Annual running costs of jeep in mustering	= £24
Total extra costs of mustering by plane (Tiger Moth)	= £106

(*b*) *Saving in Labour time through Mustering by Aeroplane*

An estimate has been made of the labour time which is needed on this property to muster by aeroplane. On the average a mustering of a paddock takes:

1 man 1 hour in the plane	= 1 man-hour
1 man 4 hours in the jeep	= 4 man-hours
Total number of man-hours for a single mustering of a paddock	= 5
Total number of man-hours for a year's mustering	= 160

The labour time involved in the alternative method has been estimated in a similar way. That is:

3 men 6 hours on horseback doing initial mustering	= 18 man hours
4 men 6 hours on horseback finding strays	= 24 man-hours
Total number of man-hours for a year's mustering	= 1344

The saving in labour time through mustering by aeroplane is 1,344 man-hours less 160 man-hours, that is 1,184 man-hours. The estimated

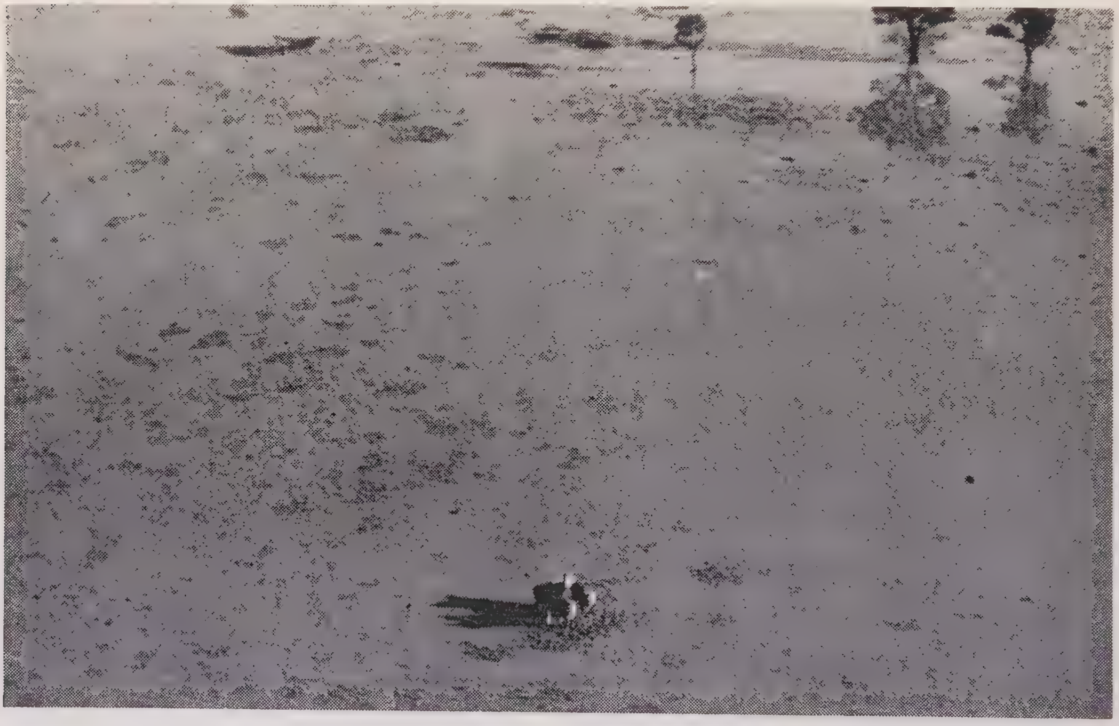


Plate 4

Stock Can Be Saved From Starvation by Dropping Food From the Air in Time of Flood.

ost of doing this work is approximately £110. rovided the 1,184 man-hours saved are worth iore to the property than £110, the use of the lane in mustering is economical.

For the purpose of giving a value to this savig in labour time, suppose an employee's wage nd keep are conservatively estimated at £15 a eek for a 50-hour week. This amounts to a ost of 6s. an hour. On this basis 1,200 man-ours would cost approximately £360. Comparig this figure with the £110 cost, it seems quite efinite that on this property, using the Tiger Ioth in the mustering work is an economical roposition. In fact, the £360 saving in labour-me would not only pay for variable costs of 110 incurred in mustering by plane (and jeep), ut also would cover the overhead on a Tiger Ioth of about £200 a year.

ther Uses for the Aircraft

Mustering is an example of the uses to which n aircraft can be put on a grazing property.

Off-property travel is another example.

Distances from this property to business centres ormally visited are only three-quarters as far by r as by road. The variable costs of a Tiger Moth re estimated at £2·55 a flying hour while the ruising speed is 84 m.p.h. This is a variable ost of 7d. a mile travelled, which, allowing for ie fact that the distance travelled on a flight is nly about three-quarters that travelled by car, ould compare with a running cost of 5d. for a ır.

Another big advantage of having the plane is in its use in locating drying or boggy earth tanks. This requires, on this property, a flight of a about 20 min. each day during which all earth tanks are examined. This is followed by a visit to those tanks where the water is low. Without the use of the aircraft every tank would have to be visited every day during dry weather. Here obviously is another considerable saving in labour time.

Again the plane is particularly suited to work in bushfire spotting, locating damage to fences from fire or flood, and is a definite aid in time of sickness.

Conclusion

It can be seen that the light aircraft is naturally suited to a variety of jobs on and around a sheep-station. On the property considered, which has open downs country, the aircraft can be used in mustering, and this looks as if it could be an attractive proposition economically, depending on the advantage taken of the labour time saved. Some properties in thickly timbered country may not be able to use the plane for this purpose.

There remain numerous other possible activities which could make an aircraft a useful "work-horse" on the property as well as offering convenience and pleasure.

Grateful acknowledgement is extended to Mr. E. J. Davis, Chief Flying Instructor, Air Academy of Queensland, and to Mr. J. Nation, Sheep and Wool Adviser, for assistance given in obtaining data on which this article is based.

Bacteria In Milk

The subject of numbers and types of bacteria ccurring in milk is a matter of some importance dairy farmers in Queensland, whether they re milk or cream suppliers. It is especially nportant during warm weather.

Milk producers are required to meet standards r quality which are laid down, such as the ethylene blue test and the thermoduric count. ream suppliers, of course, have their produce aded for flavour which is very largely deterined by bacterial growth in cream.

Bacterial organisms, which are far too small see, abound on the surfaces of all equipment, water and particularly in dust. They will ow where moisture is available.

It is clear, therefore, that the utmost care must be taken to ensure that all equipment is kept thoroughly clean, is sterilized, preferably with boiling water, and above all is left to dry so that bacterial multiplication cannot take place. Very special attention should be given to the rubberware of milking machines because these parts become a harbourage for bacteria as and when the rubber surfaces become swollen, fat-soaked or cracked.

Finally, a word about sterilization. There appears to be no satisfactory substitute for copious quantities of boiling water, remembering, of course, that boiling means bubbling.—*V. R. SMYTH, Senior Bacteriologist (Dairy Research Branch).*

Double Forage Yield With Irrigated Lucerne

By Officers of Regional Experiment Stations Branch.

Where irrigation is available it is often a problem to decide what sort of crop to gro for stock fodder.

Is it best to grow a perennial crop such as lucerne or can more feed be obtained from series of annual grazing crops?

Over the past seven years, an irrigated trial has been carried out at the Biloela Regional Experiment Station to determine the relative merits of lucerne and annual crops. Irrigation was available from a well capable of delivering 12,000 gal. an hour, and the experiment was located on a free-working clay loam soil, which is fairly typical of the Callide Valley alluvial plain.

Results of the trial show that lucerne is by far the better proposition. Here are the reasons why—

(1) The yield of air-dried fodder may be expected to be doubled by growing lucerne in preference to annual crops.

(2) A better quality grazing fodder can be obtained from lucerne. Its high protein content combined with fairly low moisture content would provide a fodder capable of obtaining maximum production from dairy stock. Although quite high in protein, annual crops would normally be too succulent to provide a ration for maximum production.

(3) Continuity of feed supply is assured, whereas annual cropping results in a loss of at least four months grazing.

(4) The soil is left in excellent condition at the end of the lucerne phase. Fertility is high and, because the structure has remained good, water from r or irrigation penetrates more readil

(5) More efficient use of irrigation wa and rainfall can be expected fr lucerne. If water is available at lov depths it is likely that lucerne w make good use of it.

(6) Once established, lucerne is much l costly to maintain.

(7) Supplies of lucerne surplus to gra needs can be readily conserved a high protein hay.

It should be borne in mind, however, t these findings are valid only for crops gro under irrigation in central Queensland. Un other circumstances, annual grazing crops have an important part to play. But the t does highlight the great value of lucerne.

The experiment was set out in two pha each of 3½ years.

In the first phase, 1952-55, an area planted to lucerne, while an adjacent area used for continuing summer and winter ann grazing crops. In the second phase, 1955- cropping was reversed; that is, lucerne was plan in the area previously annually cropped, vice versa.

Supplementary irrigation was applied to all :ops in both phases with the intention of pro- ucing maximum yields.

The annual grazing crops used were oats, oats nd field peas or vetches during winter, and cow- eas or mung beans with giant setaria during the ımmer.

irst Phase (1952-1955)

During the 3½ year period, lucerne produced 3½ tons of air-dry material to the acre and 31 azings were possible. Best lucerne production otained was 19 cwt. of air-dry material to the :re in 28 days, during the November-December eriod of 1953.

Overall, 10·9 tons to the acre of air-dry aterial were produced by annual crops and 21 azings were possible. Best annual crop pro- uction was 10 cwt. an acre of air-dry material 29 days in the January-February period of 954. It is well to remember that the area nder annual crops was out of production for least a third of each year while land was being repared for the following crop. In the graph Plate 1) it is seen that the line showing lucerne roduction rises quickly above that for annual rop production after the first winter.

rigation Applied

Water usage for the first phase of the experi- ent is shown in Table 1. No account has been ken of water which lucerne roots may have ken from lower depths not touched by annual ops. Also, losses due to evaporation would be gher from soil worked for annual crops. It ill be noted that in the case of lucerne the same mount of water produced twice the yield of y material.

TABLE 1

ATER USAGE AND PRODUCTION, MARCH, 1952 TO OCTOBER, 1955

——	Lucerne	Annual Crops
ainfall (in.)	109·25	109·25
rigation (in.)	87·75	65·25
ater in top 5 ft. of soils at original planting (in.)	4·00	6·00
otal water (in.)	201·00	180·50
ons air-dry material produced per acre	23·53	10·86
. water per 1 cwt. air-dry material	0·43	0·82

The protein content of all grazing crops was high, although that of lucerne was higher throughout.

Soil Structure

A marked deterioration occurred in soil structure and in the rate of penetration of water into the soil of the annually cropped area. Run-off was more severe in this area.

Fertility of the soil in the cropped area was not affected very much. It appeared, however, that it was essential to plant a legume with the winter crop to provide nitrogen in the later stages of growth.

Lucerne, oats, vetches and giant setaria continued to produce reasonably well with repeated grazings, but field peas and cowpeas could not stand repeated grazings satisfactorily.

After 3½ years the lucerne had thinned out slightly due to weed invasion with continued grazings, while the soil in the cropped area was becoming powdery and water penetration was poor. Both areas were ploughed in October, 1955.

Second Phase 1956-1959

The establishment of lucerne in the area previously cropped to annuals was a little difficult due to the poor soil structure. In the first season, run-off of irrigation water and rainfall was severe, but a good stand was obtained later. Early lucerne yields were therefore poor.

The first oat crop growing in the land previously cropped to lucerne was extremely vigorous. A total of 2·7 tons of air-dry material an acre was produced, and five grazings were possible. The oats were of very high protein content.

The winter of 1956 was the only one of the seven in which annual crops outyielded lucerne.

During this second phase, lucerne produced 22½ tons an acre of air-dry material and provided 28 grazings. Best production for the second phase lucerne crop was achieved when 27 cwt. to the acre of air-dry material were produced in 34 days during November-December, 1957.

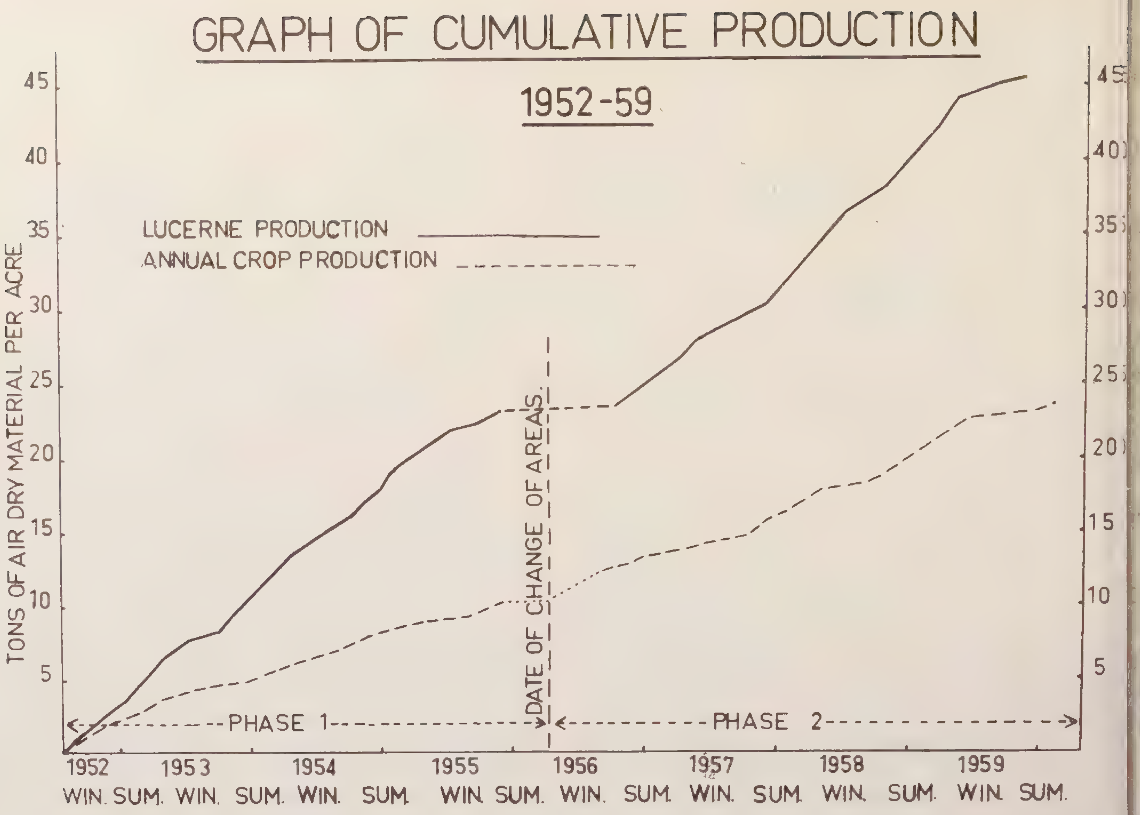


Plate 1

Production of Lucerne and Annual Fodder Crops.

Annual crops produced 13·1 tons an acre of air-dry material in 19 grazings over the 3½-year period. Maximum production from the areas cropped to annuals was obtained when 16 cwt. air-dry material to the acre were produced in 36 days during the period May-June, 1956.

The pattern of growth as shown in the cumulative graph (Plate 1) is similar to that of the first phase of 3½ years. Apart from the winter of 1956 when oats outyielded lucerne, the production line for lucerne once again quickly increased above that for annual crops.

Water usage in the second phase was similar to that of the first phase but annual crops needed more irrigation than lucerne. Lucerne again produced almost twice as much feed for the same quantity of water supplied to annual crops.

TABLE 2

WATER USAGE AND PRODUCTION APRIL, 1956
OCTOBER, 1959

——	Lucerne	Annu Crop
Rainfall (in.)	77·25	77·
Irrigation (in.)	120·05	127·
Water in top 5 ft. of soil at original planting (in.)	3·50	4·
Total water (in.)	200·80	209·
Tons air-dry material produced per acre	22·50	13·1
In. water to produce 1 cwt. air-dry material	0·44	0·

At the end of the second phase, run-off occur in the cropped area. The lucerne stand once again thinned out allowing the invasion weeds.

TABLE 3

NNUAL PRODUCTION OF LUCERNE AND ANNUAL CROPS

Phase and Season	Air-dry material in Tons per Acre	
	Lucerne	Annual Crops
ase 1—		
1952–53	6·90	4·57
1953–54	7·07	1·94
1954–55	7·78	2·84
1955–56 (part year)	1·78	1·51
ase 2—		
1956–57	4·92	3·78
1957–58	8·23	3·66
1958–59	8·30	4·84
1959–60 (part year)	1·05	0·82
otal for 7 years	46·03	23·96
oduction per year	6·58	3·42

Summary of Results

The graph summarises the results of the two phases as a whole. It is seen that lucerne continued to produce at a higher rate than annual crops throughout the 7-year period. Yearly production figures are set out in Table 3.

Further dissection of these yields revealed that summer production of lucerne at 4·6 tons of air-dry material an acre was twice that of the winter production over the 7-year period. Corresponding summer and winter production figures for annual crops were respectively 1·9 and 1·6 tons of air-dry material to the acre.

During the seven years of trial, lucerne consistently yielded 20 to 25 per cent. (23 per cent. average) crude protein on a dry matter basis. Annual crops ranged in crude protein matter from 9 to 25 per cent., with an average of 17 per cent.

Plate 2

In the Second Phase of the Trial, This Lucerne Paddock is being Grazed in October, 1956.

Plate 3

This Picture shows the Outstanding Production from the Irrigated Annual Crop Immediately following Lucerne. The Crop is Vicland Oats, and it is being Grazed for the Fifth Time in October, 1956.

Conclusion

Where irrigation is available, lucerne production seems a better proposition than annual grazing crops on soils similar to those of the Callide Valley alluvials. A certain bloat risk is involved in grazing lucerne, but this can be largely overcome by spraying the crop with tallow before grazing. (See Q.A.J. Nov., 1959, pp. 707-710.)

Although the lucerne thinned out on e occasion after 3½ years, a good stand still rema and reasonable grazing would have been obtai for a longer period. Lucerne greatly impro soil structure and fertility and excellent gro was obtained in annual crops in the first seas after lucerne.

* * *

Dairy Yield Firm In Dry Year

Queensland dairy herds production-recorded by the Agriculture Department came throu the dry 1959-60 milking season with little loss in production.

The Minister for Agriculture and Forestry (Hon. O. O. Madsen, M.L.A.) said th average production per cow was 4,038 lb. of milk containing 169 lb. of butterfat. In the 1958-5 season, the average yield was 4,020 lb. of milk containing 170 lb. of butterfat.

In the 1959-60 herd recording season, the average length of lactation was 243 days, th same as in the previous year. The average butterfat content of the milk last season wa 4·2 per cent.

Mr. Madsen said the number of cows production-recorded had increased to 47,607 la year compared with 43,412 the year before. When group herd recording was commenced in th 1948-49 season, the average yield of all cows tested was 144 lb. of butterfat.

Crossbred Steers Outweigh Purebreds

By R. A. BARNETT, Cattle Husbandry Branch.

During a trial period of 504 days following eaning, a group of Shorthorn-Aberdeen Angus rossbred steers gained an average of 125 lb. nore than a similar group of purebred Aberdeen ngus steers grazing on improved dryland pasture n southern Queensland.

Previous field trials of this nature in Queensand have involved a comparison between British reed and Brahman cross animals.

The ability of first cross animals to grow faster han the purebreds of either parentage is generlly recognised. This trial indicates the faster rowth rate of first cross animals under good astoral conditions.

This project was possible through the co-peration of Mr. Reg. Shannon, Manager of The cottish Australian Company's Texas property, Texas Station", whose assistance is gratefully cknowledged.

election of Cattle

The cattle selected at the commencement of he trial were weaners. Weighing commenced mmediately after weaning in June, 1958. They vere steers, bred on the property, with an age ange of 6 to 9 months, and consisted of 15 purered Aberdeen Angus and 15 first cross between horthorn and Aberdeen Angus. The crossbreds vere the result of the mating of purebred white eef Shorthorn bulls with purebred Aberdeen ngus cows.

The dams of the weaners in each group of his trial were similarly bred, of the same ageroup, and had been pastured under similar conlitions.

One purebred died during the course of the rial and performances in this group are based hroughout on 14 head.

Management

Both groups were run together as one mob and were subject to the same environment and management at all times. It was intended that these steers would remain in the one paddock for the duration of the trial. However, after a year's grazing in this paddock, consisting of 20 acres with a mixture of prairie, lucerne, clover, kangaroo grass and some couch, the steers had to be transferred to an alternative paddock of lucerne and native pasture.

After a month of grazing in this paddock the cattle were dipped in a DDT preparation to combat an infestation of lice. It is considered that the lice were primarily responsible for the weight loss which occurred in both May and June, 1959.

Identification and Weighing

The cattle were fire-branded, as well as being ear-tagged with numbered aluminium tags.

The normal weighing procedure was to yard all animals between the hours of 5 and 6 p.m. and commence weighing about 9 o'clock on the following morning. This meant a fasting period of approximately 16 hours before weighing.

Weighing was carried out normally at 28-day intervals.

The initial average liveweight of the 15 purebred Aberdeen Angus was 398 lb. with a range of 346 to 448 lb. The 15 Shorthorn-Aberdeen Angus crossbreds averaged 35 lb. lighter at 363 lb. with a range of 307 to 436 lb. This weighing was carried out on June 25, 1958.

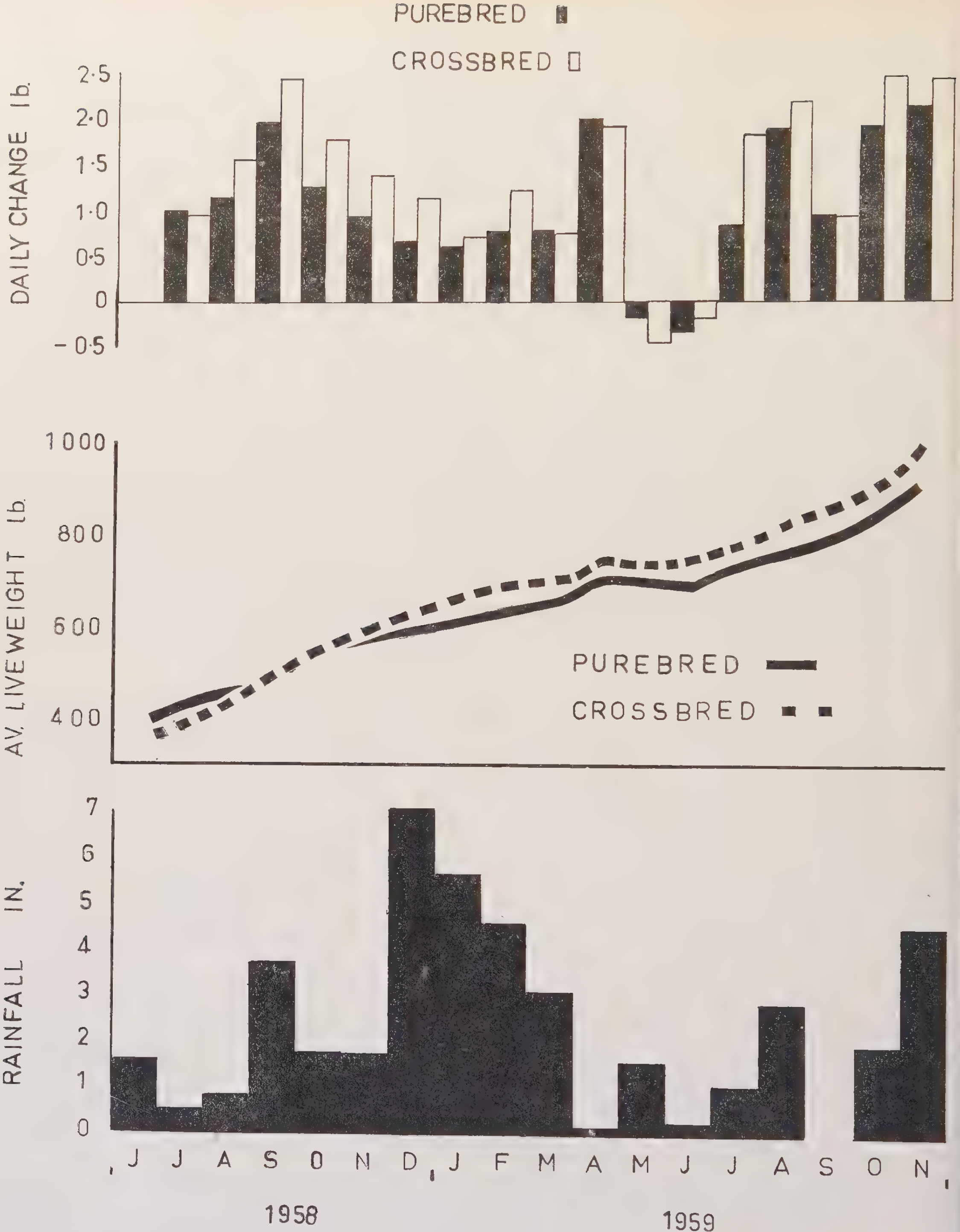


Plate 1

The Average Daily Change in Weight of each Group Calculated on a Monthly Basis is Shown in the Top Figure. The centre figure shows the growth curve for each group. Monthly rainfall recordings for Texas are shown in the bottom figure.

By October 15, the crossbred group had overcome the 35 lb. difference and averaged 1 lb. heavier than the purebred group. During this period of 112 days, the purebred group's average gain was 150 lb. as against the crossbreds' 186 lb.

During the following 200 days, the average daily rate of weight gain of both groups decreased. However, the ratio between the gains of the two groups was similar to that of the first 112 days. At this stage (April, 1959) the crossbreds were 43 lb. heavier than the purebreds.

During May the condition of the pasture deteriorated to such an extent that the steers had to be removed from the 20 acre paddock of improved pasture on which they had been grazing since the commencement of the project to another paddock of lucerne with access to matured native pasture.

Both groups of steers lost weight during May and June. This was attributed to the state of the pasture plus the added effect of a heavy infestation of lice. The purebred group lost an average of 14 lb. in comparison with a loss of 18 lb. recorded by the crossbred group.

From the end of June to the completion of the trial on November 30, when the steers were slaughtered, both groups improved remarkably in condition and liveweight. The final weighing was carried out on November 11. The average weights recorded at that time were:

Purebred group	903 lb.
Crossbred group	993 lb.

Slaughter Results

The steers were slaughtered on November 30, a period of 19 days after final weighing. In calculating the dressing percentage, use was made of the average daily liveweight gain for the 28 days preceding November 11, to estimate the final liveweight on the property.

The purebred's average chilled dressed weight was 536 lb., giving a dressing percentage of 57, whilst the crossbreds averaged 585 lb. with a dressing percentage of 56·4. The average difference in dressed weight was 49 lb.

At £10 per 100 lb. of beef, this difference is an advantage of £4 18s. a head in favour of the crossbred group. In addition, it should be noted that the crossbreds were initially 35 lb. lighter than the purebreds.

Judged on conformation, quality and finish, all carcasses were graded first but three were downgraded due to bruising.

SUMMARY OF RESULTS

Group	Initial Liveweight 25–6–58	Final Liveweight 11–11–59	Chilled Dressed weight 30–11–59	Dressing %	Liveweight gain 504 days	Gain per day
	lb.	lb.	lb.		lb.	lb.
Purebreds	398	903	536	57	505	1·0
Crossbreds	363	993	585	56·4	630	1·25

Statistical analysis indicates—

(*a*) That the calves with heavier initial weight within each group gained less weight over the trial period than the lighter calves; and

(*b*) The crossbreds gained significantly faster than the purebreds.

* * *

Botany For Farmers

Although compiled in the first place for beekeepers, "The Honey Flora of South-Eastern Queensland" has a use for farmers and others interested in botany. It contains illustrations and descriptions of the important ironbarks, gums, bloodwoods, boxes, stringybarks, wattles, tea-trees, and cultivated plants such as lucerne, pumpkins, oranges and clover.

"The Honey Flora of South-Eastern Queensland" contains 199 pages and 178 illustrations. Prices are: In Queensland 15s. a copy, with a 3s. discount to registered apiarists, University botany students and booksellers; elsewhere £1 a copy.

The Case Of The Coughing Pig

By E. R. JOHNSON, Veterinary Officer

If you admit to having coughing pigs in your piggery you have plenty of company. Coughing pigs are so common! And seldom is a coughing pig a thrifty pig.

Pneumonia is the most commonly encountered lesion in swine. In fact, in a survey done at Cannon Hill abattoir from March to August 1958, south Queensland swine turned in the startling figure of 76·25 per cent. with pneumonic lungs. What is the significance of this? Well, to the farmer it means poorer pigs, poor conversion rates, wider food/gain ratios, excessive retention of pigs until they attain market weight, and uneven litter size.

Numerous agents can cause pneumonia, and sadly enough, under many of the existing conditions they readily get their chance. In past years these agents formed a rather confusing and obscure picture, but today they have been largely sorted out and may be seen in truer perspective.

Let us look into those agents that cause pneumonia and also into some of those commonly *believed* to cause that affliction.

Virus Pneumonia of Pigs

Cause.—The disease virus pneumonia of pigs, commonly referred to in its abbreviated state of V.P.P., is due to a virus which has an Australia-wide distribution and is *by far* the major cause of pneumonia in pigs in this country.

Transmission.—It is transmitted by droplets of virus from a coughing pig to others in the immediate vicinity that inhale it. The disease is commonly introduced to a piggery via coughing stores but may be brought in by symptomless "carriers" in stores or breeding stock. From there it can smoulder on for years even if introductions are stopped. Piglets frequently become infected from their mothers. One pig was known to be infected for 66 weeks. From these last two facts you can see that once the disease is in, it is usually in for keeps if no action is taken.

V.P.P. is easily the most common cause of pneumonia in pigs, but, by itself it seldom causes a severe pneumonia. This is caused by the secondary bacteria which invade the lung after the virus.

Symptoms.—Ten to 16 days after exposure to infection, symptoms may be seen. Infected pigs can usually be divided into three groups:

(*a*) Symptomless and sub-clinical
(*b*) Acute
(*c*) Chronic

(*a*) Symptomless and sub-clinical. These are pigs of any age that harbour the virus without showing signs, or exhibit only fleeting signs when they are agitated or stirred up. The fleeting signs are usually a slight cough or irregular respiratory movements. Pigs in this category—a rather big category—are said to maintain condition and fatten moderately well, but they pose a big problem in that they maintain the virus in the herd and spread it to susceptible pigs.

(*b*) Acute or sudden onset. This type of disease occurs when a carrier or infected animal is introduced into a clean herd. Here all ages contract the disease, sickness can be 100 per cent. and deaths may be high. Younger pigs are more likely to die and death is due to effects of virus alone. Main signs are moderate fever (up to 106 deg. F.), poor appetite, lassitude,

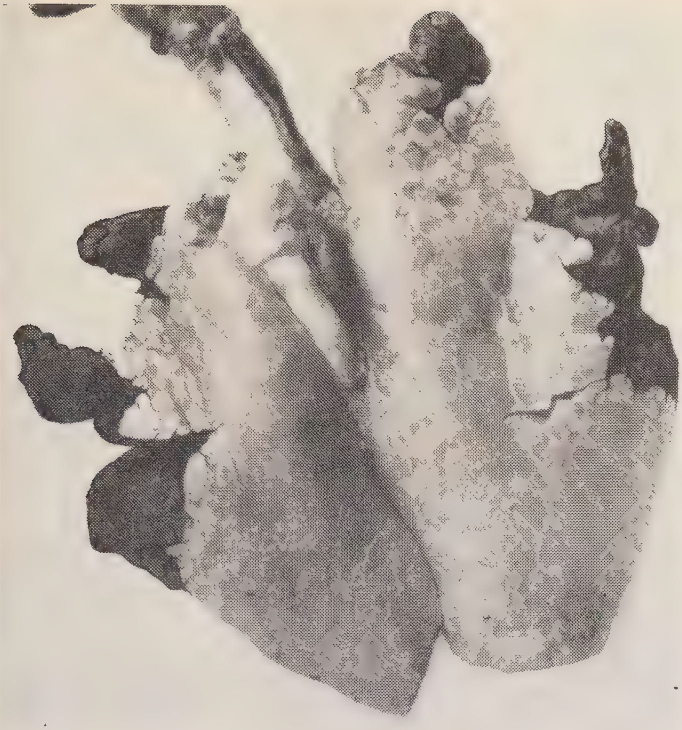


Plate 1

Note How the Darkened Hanging Parts of the Lung have been Destroyed by Virus First, then Bacterial Invasion. The destroyed tissues are plum-coloured, shrunken, feel hard and are clearly demarcated from healthy lung tissue.

slight cough and laboured respirations. Signs of infection disappear slowly, taking up to several weeks, and usually the affected pigs become very poor doers. The acute type is not the characteristic type.

(*c*) Chronic or long-standing. V.P.P. in the chronic form is found in 50 to 75 per cent. of affected piglets. It is the characteristic form of the disease. Pigs after an initial attack of the virus usually settle into this category. This is because many secondary bacteria invade the virus-damaged lung tissue and set up abscesses, inflammation and seats of infection. At this stage a delicate balance is set up between the pig on one side and infective agents on the other. Should adverse conditions prevail (poor housing and bedding, inadequate feed, excessive moisture and so on) the balance moves in favour of the infective agents. However, if pigs are housed well, kept dry and fed a good ration, the effects of the infective agents are mitigated considerably.

Signs seen in the chronic type of infection are—a very characteristic harsh, dry non-productive cough, appetite normal but food conversion poor; the coat lacks normal "bloom," and the skin may have a grey tinge. The cough is readily brought on by forced exercise.

Treatment.—There is no real treatment for the disease, but in the more severely affected pigs antibiotics may be used to control secondary bacteria.

Prevention and Control.—V.P.P. may be controlled by establishing a virus pneumonia-free piggery and employing a policy of no introductions or introductions only from V.P.P.-free herds.

There are three main ways of establishing a clean herd.

(1) Mate a clean boar to a clean sow.

(2) Remove piglets from the sow at farrowing and rear them artificially.

(3) Assure piglets are clean by removing them via Caesarian section at birth.

Whichever method is employed, remember that the virus droplets will not carry over 6 feet, so this makes it quite easy to start your free herd while disposing of your infected herd. Even an empty sty or pen between infected and free herds would be sufficient.

In (1) a piggery thought to be V.P.P.-free should be chosen. On this property a sow of at least three litters should be chosen (older sows are less likely to be infected) and subjected to vigorous exercise by means of agitation, chasing, and so on. Keep this up for some time and if the sow coughs at all—that harsh dry characteristic cough—she is out. In fact that piggery is out! Select a new piggery and repeat until a sow is obtained that can withstand vigorous exercise without coughing. In a similar fashion, select a boar. Remove these to clean quarters and mate. Half the resulting litter should be slaughtered after 4 weeks or so. If they are free of V.P.P. then the remaining half litter can be used as the nucleus of the new herd.

With (2) removal of piglets at farrowing and artificial rearing will undoubtedly result in many piglet deaths, but enough will be reared for a herd nucleus. This method appears to be the most practical method for the farmer as he can use his own stock and begin it at the next farrowing, without having to approach other properties, select, mate and wait. Once again, half the litter should be slaughtered for lung examinations.

The Caesarian method (3) is largely experimental and would have very limited practical application.

Swine Influenza

Swine influenza is a type of pneumonia which is caused by a virus not definitely known to be present in Australia. In 1944, an American veterinarian in Brisbane isolated what he said was this virus from a Beaudesert pig. Since it has never been detected subsequently and since the V.P.P. virus was not known until 1951, it seems likely that he may have been confusing these two viruses. However, some field outbreaks have been very reminiscent of this disease.

Swine Plague

The name of this disease, in Australia, is far more frightening than is the actual disease. Swine plague (pasteurellosis) is caused by a bacterium called *Pasteurella suiseptica* which in this country, for some reason or other, is not the severe blood-poisoning agent it can be overseas.

In our country the organism's role is almost solely that of a secondary invader. But make no mistake, it can kill and it can cause serious ill-thrift in pigs. About 70 out of every 100 pigs with a chronic pneumonia have Pasteurella in their lungs—a direct cause of ill-thrift.

This organism is an eager invader. Its prey are pigs with a primary virus pneumonia or pigs of lowered resistance in wet, draughty, muddy quarters or again, underfed poorly nourished pigs with little resistance. Make no mistake—when Pasteurella comes in under these conditions it can and does kill or severely affect thrift.

Infection	Age	Liveweight
	Days	Lb.
V.P.P. + Pasteurella infection . .	131	38
V.P.P. alone	120	66
Lungs, infection free	120	104

These figures were obtained under experimental conditions.

In practice V.P.P. never occurs alone. It is either V.P.P. plus secondary invaders or lungs free of infection. And what can be done about this?

The same simple management practices as outlined for V.P.P. hold here. Feed them properly, house them well, eliminate dampness and the problem is usually in hand. However, if already present, the organisms may respond to antibiotic treatment.

Swine paratyphoid (Salmonellosis)

The bacterial disease of Salmonellosis is the most common general infection of pigs in Australia. In addition to this, the organism usually concerned in Australia, *Salmonella cholerae-suis* variety *kunzendorf*, possesses marked invasive powers. So it is little wonder that the organism is so often found in pneumonic lungs of swine.

However, a Salmonella pneumonia is usually seen in survivors subsequent to a sudden and severe outbreak of paratyphoid. In an outbreak animals are often found dead or scour severely, show a purple discoloration of the skin, high temperature (105 to 108 deg. F.), muscular weakness and may have eye and nasal discharges. If the pigs linger a few days or survive the infection they usually develop respiratory signs including cough and difficulty in breathing, as by then the organisms have lodged in the lung. These pigs are likely to remain chronically affected and become poor doers.

Treatment.—Long-standing cases are less likely to respond than are early cases. Antibiotics, sulphonamides and furazolidone have all been

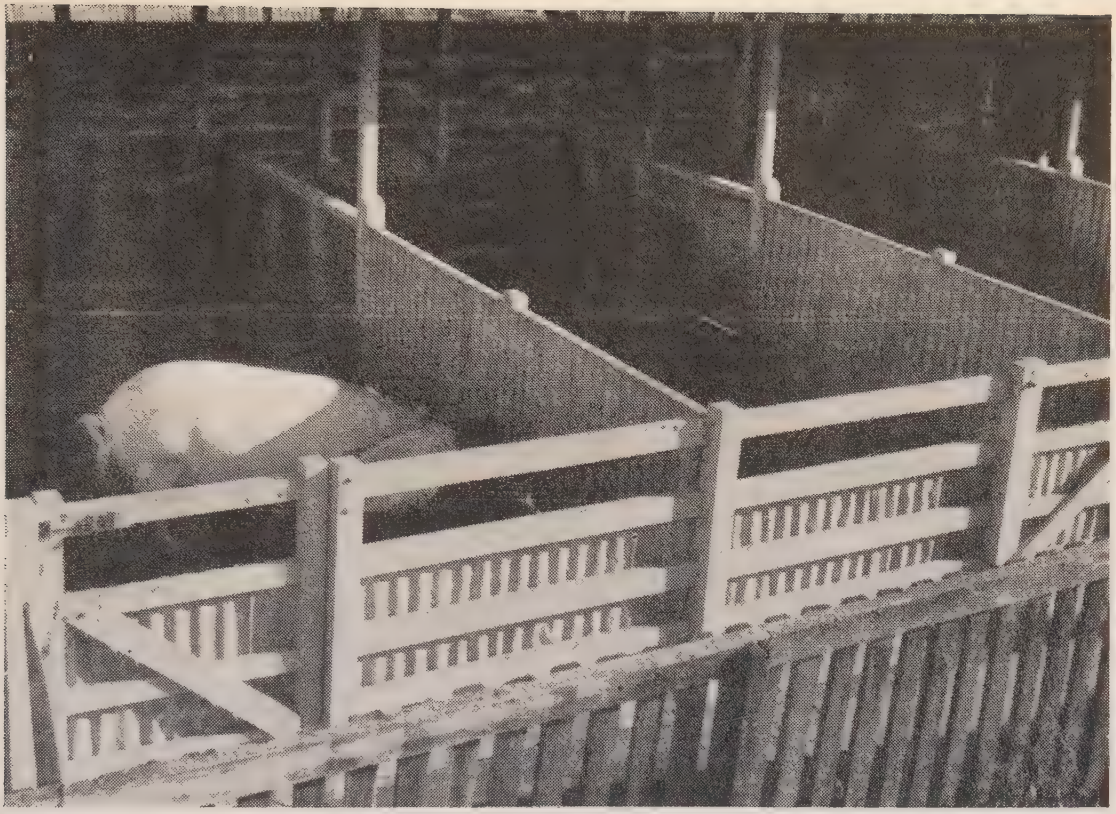


Plate 2

It has been Established that the V.P.P. Virus will not Transmit over 6 ft. (Open Space) or over 10 ft. (under a Common Roof). Therefore, one of these 10 ft. wide, roofed pens would be a sufficient buffer between infected and clean herds.

used with some success. However, sulphamezathine, the most readily available treatment, frequently gives good results. In an outbreak both sick pigs and in-contact pigs should be treated with the whole of the affected group being isolated. This treatment of paratyphoid should be carried out early in the disease before mass deaths and pneumonic "lingerers" occur.

Prevention.—Avoid buying in pigs—the main source of introduction. If this must be done, isolate the introductions for 2 to 3 weeks before adding to the home herd.

At times the disease comes into a self-contained piggery via rats. If this occurs isolate and treat early in the course of the disease.

Verminous pneumonia

There is a widely-held belief that the large roundworm, *Ascaris suum,* of pigs is responsible for the coughing-pneumonia symptoms frequently seen in pigs. To this state had been given the names "verminous pneumonia," "ascaris pneumonia" and "pulmonary ascariasis."

However, in the light of recent works it seems certain that worms are not the cause of the chronically coughing, poor doer pig. Why was the roundworm blamed in the first place? Well, the large roundworm, the commonest worm in pigs, is commonly found in the small intestine of the pig and its eggs pass out in the pig's faeces to be ingested accidentally later on. These eggs are ingested, hatch in the stomach and small intestine, and the larvae pass via the blood to the liver, heart and then the lungs. At the lungs the larvae burst into air sacs from the blood and *do cause a cough* whilst doing so. This cough causes them to be swallowed to the small intestine, where their life cycle is completed as they grow to adults.

So with those three facts—

(*a*) Roundworms are extremely common in pigs.

(*b*) Roundworms do cause a cough.

(*c*) Coughs are extremely common in pigs.

it was misinterpreted that worms are the common cause of the harsh dry cough in swine.

However, it has been shown that even in swine fed 250,000 to 500,000 infective larvae of the roundworm (an exceptionally heavy dose) though a temperature rise and cough were produced in half of the pigs, *the cough was soft and moist and persisted for only five days at the outside* (from the 7th to the 12th day). Furthermore, pigs were autopsied after receiving heavy doses, with the following result: larvae-injured lungs were healing by 10 days and were completely healed by 21 days.

So prior to this discovery it seems that once again confusion existed with the widespread V.P.P. disease.

Though roundworms are not responsible for the chronic cough and associated ill-thrift in pigs it is likely that they can "trigger" off pneumonia by carrying infection in or by injuring the lung so that infection can get in.

It should be remembered, however, that these worms can cause severe ill-thrift via their action alone from the pig's intestine and also by causing severe liver damage.

Treatment.—Both sodium fluoride and the piperazine compounds are highly efficient in removing roundworms.

Lungworm pneumonia

This pneumonia is due to the swine lungworm, *Metastrongylus sp.*, which is present in all States of Australia.

It is of little consequence. Seldom does it cause any major trouble. When present it is usually in young pigs under six months of age, lives in the terminal air passages and set up a bronchitis and pneumonia. However, pneumonia here is again due to bacterial or viral invaders.

The lobes of the lungs involved are mainly the vertebral (largest or hind-most) lobes and signs of worms are star or wedge-shaped sunken "scars" over these lobes.

There is a treatment for the swine lungworm but then the lungworm of the pig is not the problem that the lungworm of the ruminant can be. Do remember that the swine lungworm needs the ordinary earthworm to complete its life cycle. Larvae of the lungworm are eaten in by the earthworm and then the pig in turn must eat in the lungworm larvae from the earthworm.

If your pigs are coughing and doing poorly it is most unlikely that the lungworm is the cause.

Dry Feeding

It was once thought that the feeding of pigs on dry diets like crushed grain, meal or pollard caused pneumonia. Since the recent discovery (1951) of the V.P.P. virus, it seems certain tha this is not true.

Other Miscellaneous Causes

(i.) Tuberculous pneumonia. T.B. is sometimes responsible for odd cases of pneumonitis. It is rare and usually abdominal lesions are seen not lung lesions. This is because the disease i mainly eaten in (infected milk, carcasses) and not breathed in as in cattle.

(ii.) Glässer's disease. This disease is comm and widespread in Queensland and frequent associated with it is a pneumonia. Whether thi pneumonia is truly a part of Glasser's diseas or whether it is an incidental V.P.P. infectio is, at present, uncertain.

Summary

To put it in a nutshell—if your pigs ar coughing, poor doers and show signs of pneumonia, especially at or after weaning, the chance are 7 out of 10 that you have a virus pneumoni (V.P.P.) problem on your hands. If those pigs are poorly kept or underfed, Pasteurella an Salmonella will probably be present as a low grade energy-sapping infection. Worms will no explain much. Swine influenza probably does not enter the question. "Dry feeding" cough are in reality coughs due to V.P.P. T.B. wi explain but one case in hundreds. Glasser disease will be accompanied by other severe sign and you will quickly realise that it's not jus a pneumonia problem.

The enormous role of V.P.P. is obvious!

Feeding Tray For Pet Lambs

By C. R. SMITH, Senior Adviser in Sheep and Wool.

A device that lessens a good deal of the ndividual attention required in feeding several pet lambs was seen on a Dalby fat lamb farm recently.

It consisted of a lamb self-feeding tray constructed to carry a number of bottles with the teats securely fixed so that they could not be pulled off by the lambs during feeding.

The tray can be constructed easily from odd timber. A diagram of the device is given in the accompanying plate.

Main construction particulars are as follows:

The frame is built from light timber, and stands on short legs. The length of the frame is 3 ft. and the width 2 ft. An inverted V tray takes up the middle of the frame, sloping from the centre to each outside. Each side of the inverted V tray supports six leaning 26 oz. bottles.

Running the length of the frame on each side is a board in which holes have been cut, the result resembling a "bobs" board. The bottles are laid neck downwards on the tray so that the "bobs" holes support the necks of the bottles.

To prevent the teats being pulled off by feeding lambs, rubber rings are used. These are cut from a car's used inner tube. The rings are 2 in. wide and have a small slit cut at one end.

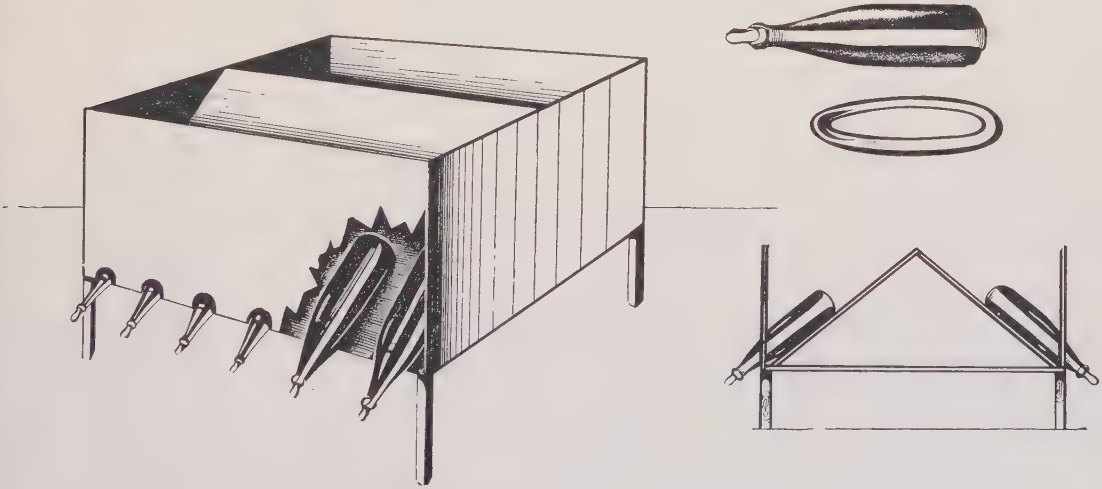


Plate 1

Left: The Feeding Tray Ready For Use. Right Top: Bottle with Teat and Rubber Ring. Right Bottom: Positions of Bottles on the Inverted V.

The teat is placed on the full bottle, slipped through the slit in the rubber, and the rubber ring pulled taut over the bottom of the bottle.

Early Lamb Care

If the orphan lamb has not suckled its mother, give a teaspoon of warm castor oil before feeding with cow's milk. The colostrum or first milk from the ewe's udder causes bowel movement and evacuation of bowel contents, as well as supplying antibodies which protect the lamb against infections. Castor oil does not contain antibodies as does the colostrum, but it does help to expel the meconium, or first faeces, of the young lamb, and starts off normal bowel movements.

Feed a lamb little and often in the first tw
weeks or so. The equivalent of half a sma
tomato sauce bottle of pure warm cow's mi
five times a day is suitable. Thereafter half a 2
oz. bottle three times a day should suffice. A
bottles, utensils, and teats should be well wash
and scalded between feeds, and kept in a fly pro
gauze safe when not in use.

After 4 weeks, provide supplementary feed f
the lambs as well as milk. Equal parts by weig
of lucerne chaff and cracked grain plus 1 p
cent. of fine ground limestone can be fed from
self-feeder. Water also should be made ava
able.

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Using Herd Recording Results

By C. H. CLARK, Technologist, Farm and Herd Surveys.

The use of the Annual Herd Summary in conjunction with the Sire Survey results enables members of the Herd Recording Scheme to cull their low-producing animals and select breeding stock for rearing of high-producing replacements. These production records also afford an important check on many farm and herd management practices.

Approximately one-quarter of the dairy farmers in Queensland have been members of the Herd Recording Scheme supervised by the Department of Agriculture and Stock. Some have recorded their herds for short periods only, but the majority have remained in groups for one year or more. This service by the Herd Recording Section provides information on the production of individual cows, and measures the capabilities of bulls according to the production of their daughters. Material is provided each month to members in the form of a Herd Recorder's Record Sheet, and in a Monthly Progressive Production Sheet. At the end of the year all records of the length of lactation, total milk and butterfat yield for individual cows are summarised in an Annual Herd Summary, and Sire Surveys are prepared.

TABLE 1

COMBINED RECORDS FROM ANNUAL HERD SUMMARIES

(R. denotes replacement cows)

1st Summary—1957–58						2nd Summary—1958–59					
No. of Cow	Age	Month Calved	Lactation (days)	Milk (lb.)	B/Fat (lb.)	No. of Cow	Age	Month Calved	Lactation (days)	Milk (lb.)	B/Fat (lb.)
9	5	7–56	300	4,755	231	9	5	8–57	300	4,600	200
10	5	8–56	270	3,900	191	10	6	8–57	270	4,010	186
17	5	8–56	270	4,140	189	17	5	8–57	150	1,680	77
21	8	7–56	270	3,930	170	21	9	9–57	210	1,965	83
14	4	9–56	240	3,780	164	14	5	9–57	300	3,690	165
22	4	9–56	210	3,045	150	22	. .	8–57	270	3,255	162
24	3	7–56	240	3,885	144	24	CULLED				
18	3	7–56	210	3,885	112	18	CULLED				
6	2	11–56	210	4,500	173	6	5	11–57	210	3,885	152
27	2	9–56	240	3,810	167	27	3	9–57	210	3,010	120
25	2	10–56	210	3,000	135	25	3	10–57	240	3,210	141
15	2	11–56	180	2,745	121	15	3	10–57	270	3,715	160
23	2	10–56	210	2,500	114	23	3	10–57	240	2,620	120
26	2	12–56	180	1,935	87	26	3	11–57	150	1,700	72
						16R	5	9–57	240	4,215	200
						12R	. .	10–57	240	3,870	170
						4R	. .	10–57	300	4,945	201
						1R	3	8–57	240	3,090	123
						20R	3	11–57	240	4,000	165
						7R	2	10–57	210	3,685	162
						3R	2	10–57	270	3,115	146
						2R	2	10–57	210	2,665	129

Unfortunately some of the information contained in these result forms supplied to producers is overlooked or not fully appreciated when considering herd management practices in relation to culling and breeding. To enable recording members in particular and producers in general to make the best use of their herd records the following material has been prepared detailing the special features of the Annual Herd Summary and discussing a specific herd record:

Annual Herd Summary

During each cow's lactation a progressive total production of her milk and butterfat yield is supplied to the owner each month. At the end of the year the production records for all completed lactations are assembled in the Annual Herd Summary. It contains the records of all cows in the herd which have completed a normal lactation during the year. The records of cows which have died or been disposed of are included only if they have completed a lactation of 240 days or more. Records are tabulated according to age, and are entered in ascending order of butterfat production within each age group.

When a member has been recording for one year only, all the records of cows which have completed lactations will appear on one summary. However, when two or more years of recording have been completed it is useful to combine these results into one table for ease of comparison. One of the best ways to prepare these records for examination is to assemble them from the summaries on to a separate sheet. If this is done, the production of individual cows may be examined more easily. The sheet is prepared by writing down all the records from the first summary and then noting records from subsequent summaries against the appropriate number of each cow.

An example of a combined result sheet is shown in Table 1. It represents the records of a small herd which has been recorded for two years. The information from the first summary (1957-58) has been entered so that the records of the mature cows are listed at the top of the sheet and the 2-year-old records are entered last on the sheet. The records of replacement animals (denoted by R) from the second summary which entered the herd in the 1958-59 year are listed on the bottom of the sheet.

Records Depend on Accurate Reporting

The accuracy and detail of each summa prepared in the Herd Recording Section's ma office will depend on the information which h been provided initially on the Herd Recorde Record Sheets. Perusal of the herd results sho that information concerning the ages of co numbered 22 and 6 has been incorrect, resulti in errors on the Herd Recorder's Record Shee Sometimes ages have not been given when co commenced their lactations and records have bee included in the "Unknown" age category, f example cows 12R and 4R. In other cases t age of mature cows has been denoted by " when the accurate age was not known, f example, cows numbered 9 and 17.

The physical condition of the cow during h lactation must be considered. The records wou require amendment if attention had been draw to ailments, for example three day sickness, notings on the Herd Recorder's Record Shee If this information has not been supplied to t recorder it makes a comparison of results betwe cows and between seasons a difficult procedure.

Ranking the Cows

In Table 1 the productions entered from t first summary are recorded in descending ord of butterfat production within each age grou This way it is an easy task to pick out t highest and lowest producers in each age gro and divide the herd into three portions accordi to individual production figures. Records fro the second sumary, however, are entered oppos the number of each cow. It is therefore a li more difficult to sort out the highest and low producing cows, but if the herd average is tak as a guide the highest producers will be abo this figure.

A useful method of relating these resu between seasons to obtain information on t ability of a cow to produce at a high le continuously is to prepare a second set of tabl Using the same records shown in Table 1, resu can be arranged as shown in Table 2.

Examining the Ranking Orders

Firstly, let us examine the records of co in the top third of the herd from the fi summary, and see what happened to them the following year. Cows numbered 9 and

TABLE 2

RANKING THE COWS

	1st Summary, 1957–58	2nd Summary, 1958–59
Position	Cow No. (lb. b/fat)	Cow No. (lb. b/fat)
Top $^{1}/_{3}$ rd	9 (231)	4R(201)
	10 (191)	9 (200)
	17 (189)	16R(200)
	6 (173)	10 (186)
	21 (170)	12R(170)
		14 (165)
		20R(165)
Mid $^{1}/_{3}$ rd	27 (167)	22 (162)
	14 (164)	7R(162)
	22 (150)	15 (160)
	24 (144)	6 (152)
		3R(146)
		25 (141)
Bottom $^{1}/_{3}$ rd	25 (135)	2R(129)
	15 (121)	1R(123)
	23 (114)	27 (120)
	18 (112)	23 (120)
	26 (87)	21 (83)
		17 (177)
		26 (72)

emained in this portion on the second summary vhile cow numbered 6 moved to the mid third f the herd and cows numbered 17 and 21 to he bottom third. An addition to the top third f the herd on the second summary was cow No. 14 which was in the mid-portion on the rst summary. The other additions to these top roducing members were replacement animals. These results enable us to accept with confidence hat cows numbered 9, 10, 14 and 6 may be sed for breeding replacement stock as they had hown consistently high production for the two ears. If required, other calves should be saved rom cows numbered 4, 16, 12 and 20; but efore they are accepted as breeding stock their ecords should be examined again in 1959-60. t should be noted that cow No. 22 in the nid third of the herd has demonstrated her onsistency and her calf could be reared if it s required.

Cows numbered 17 and 21 are aged cows and ld age probably accounted for their low records n the second summary. Although they were igh producers in the 1957-58 year their monthly roduction should have been examined during he 1958-59 season. As soon as their records indicated that their production was decreasing rapidly and below the herd average, they could have been culled immediately.

A glance at the records of cows in the bottom third of the herd according to each summary shows that cows numbered 15 and 25 were the only cows which moved to the mid portion. Cow No. 18 was culled and cows numbered 23 and 26, in their second lactation, remained amongst the lowest producers. Moreover, they produced less than the 2-year-old replacement animals denoted by 1R and 2R. These two young cows which failed again on their second lactations should now be culled, while cows numbered 15 and 25 should be watched carefully.

This combination and examination of results emphasises the following points:

1. The consistently high producing animals have been pinpointed.

2. The replacement stock may be bred from animals which are in the top and mid portions of the herd.

3. Old cows are frequently retained in the herd too long. They should be culled as soon as low production is evident.

4. Young animals which are in the bottom third of the herd on their first lactation should be given a second chance and culled if they fail again without a good reason.

5. Cows which move from the bottom to the mid portion of the herd on their second lactations should be watched carefully, before being used for breeding replacement stock.

6. Attention is focussed on the manner in which basic information on each cow has been kept and recorded. Ages, calving dates, sires and so on, should be available for each cow and the poor health of cows should have been noted. Unless all information is made available to the recorder it is difficult to make an accurate decision on breeding and culling programmes.

Factors Influencing Records

Besides the influence of age and health on production records, surveys of State-wide herd recording information have shown that the month of calving, period between calving, length of lactation, length of dry period and treatment prior to calving may affect records considerably. In

TABLE 3

EFFECT OF LENGTH OF LACTATION

1st Summary—1957–58			2nd Summary—1958–59		
Length of Lactation (days)	Butterfat (lb.)	Average B/Fat (lb.)	Length of Lactation (days)	Butterfat (lb.)	Average B/Fat (lb.)
180	121	121	180	..	..
210	150, 112, 173, 135, 114	137	210	152, 120, 162, 129	141
240	164, 144, 167	158	240	141, 120, 200, 170, 123, 165 ..	153
270	191, 189, 170	183	270	186, 162, 160, 146	164
300	231	231	300	200, 165, 201	189

the case of the herd records described, the production level of cows numbered 6, 15 and 25 could have been influenced by one of these factors. It may be noted, for example, that cows 15 and 25 milked longer in 1958-59 than in 1957-58.

(*a*) *Length of Lactation.*—We may study the effect of length of lactation on production by tabulating individual butterfat records according to the number of days each cow has milked. The tabulation is shown in Table 3. The records of the aged cows numbered 17 and 21 have been deleted from the second summary, and the low records of cow numbered 26 have been deleted from both summaries.

From Table 3 it is evident that the cows which milked for 270 and 300 days produced considerably more butterfat than those which milked for 210 days.

(*b*) *According to Month of Calving.*—Another interesting analysis is to list the number of days in lactation according to the month of calving. This has been done in Table 4, and shows that in both years the cows which calved in August milked longer than those which calved in the other months.

While the number of cows in each section small, there are sufficient records from this her to indicate the influence these factors can hav on milk production. Similar studies may b made on other factors which influence individu records. It is well to recall that these facto may be responsible for variation in productio records from year to year.

Plan of Examination

Each month and at the end of the yea information is forwarded to producers who pa ticipate in the Herd Recording Scheme of t Department. To use these records effective a plan of examination and a knowledge of the importance is necessary. This article has sho how to use the Annual Herd Summaries to chec individual records and to rank cows for breedi and culling purposes. Points regarding t examination of records have been made and fa tors influencing records have been considered. has been possible to illustrate the methods using the summaries to check on these factors.

TABLE 4

EFFECT OF MONTH OF CALVING ON LENGTH OF LACTATION

1st Summary—1957–58			2nd Summary—1958–59		
Month of Calving	Length of Lactation (days)	Average Lactation Length (days)	Month of Calving	Length of Lactation (days)	Average Lactation Length (days)
July ..	300, 270, 240, 210	255	July ..	..	..
August ..	270, 270	270	August	300, 270, 270, 240	270
Sept. ..	240, 210, 240	230	Sept. ..	300, 210, 240	250
Oct. ..	210, 210	210	Oct. ..	240, 270, 240, 240, 300, 210, 270, 210	247
Nov. ..	210, 180	195	Nov. ..	210, 240	225

Crops And Pastures For Beef Cattle In The Burnett

By N. F. FOX, Agrostologist.

The purpose of this article is to show how fodder crops and sown pastures can be grown and used on beef cattle properties in the Burnett district.

Crops and sown pastures can be combined with native patures in a system of agriculture which will lead to increased turn-off and higher carrying capacities.

This stage can be reached on most properties by the adoption of a simple land development programme. I have called it unit development. It envisages the provision of units or "islands" of intensively managed areas of crop and pasture, strategically located within the property.

The species or kind of plants you grow will depend on the location of the property, its topography, soils and climate.

The success with which you use these species will depend on adoption of sound management and land use techniques.

There are some questions you want answers for:

What to grow?

When and how to grow it?

How much to grow and how to use it?

To answer these questions you should have some knowledge of:

Soils and their suitability for crop and pasture production.

Suitable fodder crops and pasture mixtures.

Establishment methods

Management techniques and their influence on land use systems.

Soils and Their Suitability for Crop and Pasture Production

Soils supply moisture and plant nutrients. They vary in their ability to store moisture. Sandy soils are commonly droughty but loams and clay soils store large amounts of moisture.

There are six major elements (Nitrogen, phosphorus, potassium, calcium, magnesium and sulphur) and seven minor elements (copper, manganese, zinc, iron, boron, molybdenum and chlorine) essential for plant growth.

Soils in the Burnett Valley and adjacent coastal districts may be designated under two main headings, coastal and subcoastal, each with a number of soil types.

Coastal Soils

Coastal soils are generally acid. The major elements, nitrogen, phosphorus and calcium are deficient over wide areas. Potassium is deficient on some soils.

No widespread evidence of deficiencies of minor elements exists though one or more may become limiting once the major deficiencies have been corrected.

Superphosphate will correct phosphorus deficiency and supply some calcium and sulphur.

Legumes, those plants which have the ability to extract nitrogen from soil air, will correct nitrogen deficiency. They make nitrogen available for following or associated grass crops.

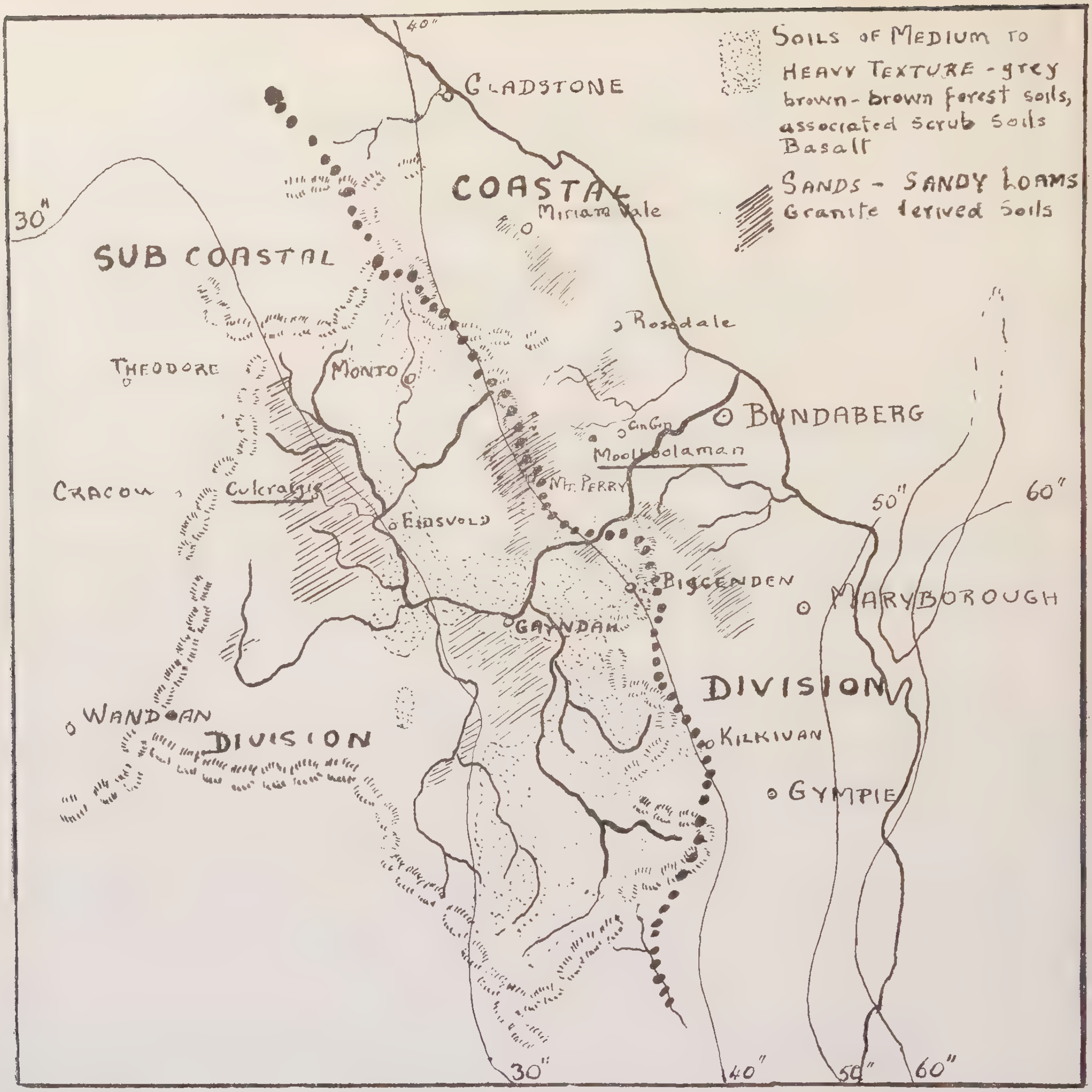

Soils of Medium to Heavy Texture - grey brown - brown forest soils, associated Scrub Soils Basalt
Sands - Sandy Loams Granite derived Soils
40"
Gladstone
30"
Coastal
Miriam Vale
Sub Coastal
Rosedale
Theodore
Monto
Gin Gin
Bundaberg
Moolboolaman
Cracow
Culcraigie
Mt. Perry
50"
60"
Eidsvold
Biggenden
Maryborough
Gayndah
Division
Wandoan
Division
Kilkivan
Gympie
30"
40"
50"
60"

Plate 1

Burnett District of South-East Queensland.

Remember, legumes vary in their effectiveness in adding nitrogen to the soil. Centro, for instance, is more efficient than stylo.

Fertilizer trials showed that superphosphate at 5 cwt. to the acre increased the yield of phasey bean from 1¼ tons to 3½ tons per acre at "Moolboolaman".

Near Maryborough the following results wer obtained with phasey bean:

	cwt.	cwt.	cwt.	cwt
Superphosphate per acre	0	2½	5	10
Yield, cwt. to the acre	7.3	17.5	27.7	24.9

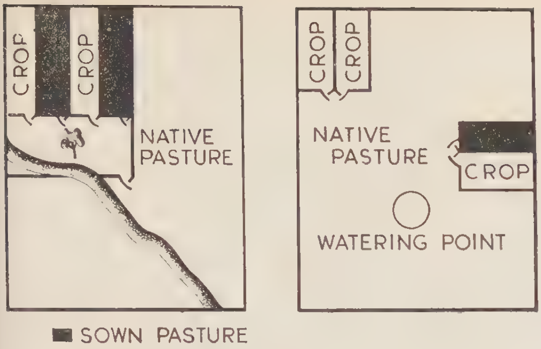


Plate 2

Diagram Showing Two Methods of Arranging Units in a Large Native Pasture Paddock.

There was progressive increase up to the most favourable application of 5 cwt. to the acre.

The effect of heavy dressings with superphosphate lasts some years. Where 10 cwt. to the acre was applied in 1953, the effects were still observed in 1960. The inference is that once a certain level of phosphorus in soil has been reached, periodic light applications only may be required.

Similar results have been obtained from trials at Rodd's Bay, Miriam Vale and Rosedale.

Evidence shows that provided superphosphate and leguminous plants are used in conjunction, fodder crops and sown pastures can be grown on a wide range of coastal soils.

Subcoastal Soils

Basalt derived soils include dark grey-brown or "black" forest soils, brown forest soils, and the associated "scrub" soils.

Scrub soils are well supplied with plant nutrients but there is evidence of a slow decline in nitrogen over the years following clearing.

Forest soils are deficient in nitrogen. Nitrogen can be accumulated by cultivation and fallowing to grow excellent grain or fodder crops. A response to sulphur by green panic has been observed at "Brian Pastures".

It is possible to grow a wide range of fodder crops and sown pastures provided legumes are included in pasture mixtures. Soil moisture conservation is important for fodder crops.

Granite derived soils are sandy soils that tend to be droughty. They are deficient in phosphorus and nitrogen. There is evidence of responses to potassium and molybdenum by lucerne at "Culcraigie".

Fodder crops, cowpeas for summer grazing followed by oats for winter grazing, can be grown if fertilizer is used.

Poor grey, forest soils (solodic) appear to be suitable only for timber and grazing at low stocking rates.

There are few soils which, given the required treatment will not produce fodder crops or sown pastures much superior in yield and quality to the native grasses they now support.

Suitable Fodder Crops and Pasture Mixtures

Climate and soils influence the selection of plants for a particular region. The 40 in. isohyet follows fairly closely the crest of the coast ranges. Crops and pasture mixtures which grow in the *subcoastal* division may not be suitable for use in the *coastal areas*. For example, lucerne will not persist under high rainfall conditions on acid and poorly drained soils. Paspalums grow on the coast but are not used in the dry areas. Townsville lucerne is better suited to coastal soils.

For further details of the crops and pasture mixtures listed contact your local agricultural adviser.

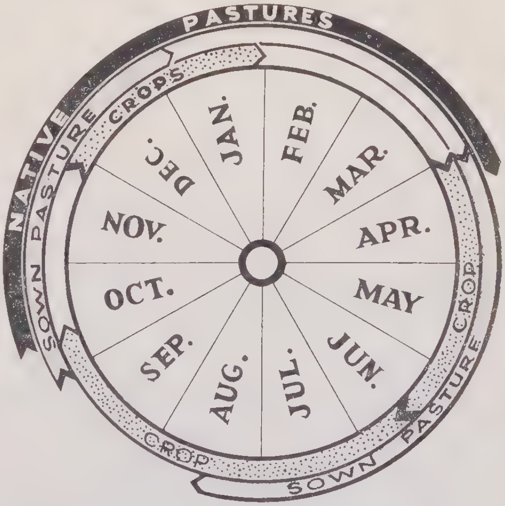


Plate 3

Grazing Seasons. Crops and Sown Pastures will Supplement Native Pastures.

Plate 4

Five Hundredweight of Superphosphate Increased the Yield of Phasey Bean Three Times.

(a) Summer-growing fodder crops

(i) **Cowpea mixtures** are suitable in both coastal and subcoastal districts. Use superphosphate on coastal or sandy soils.

Cowpea may be grown alone but usually provides better grazing if planted with white panicum or sweet sudan grass, Mixtures may be grazed, or harvested for silage.

Varieties in use are Poona, Reeves, Cristaudo, and lately Malabar, a stem rot resistant variety.

Planting time:

Sept.-Oct. for Dec.-Jan. grazing.

Dec.-Jan. for April, May, June grazing.

Sowing rates: 10 to 15 lb. cowpea (Poona) mixed in the seed box with 6 to 8 lb. of white panicum or sweet sudan grass.

Grazing: 1 to 2 beasts to the acre in conjunction with native or sown pastures.

At "Culcraigie", Eidsvold, on March 6, 1958, a cowpea/white panicum crop yielded 14 tons of green matter. From 6-3-1958 to 29-4-1958 cows with access to the crop gained 1·9 lb. a day. Cows on native pasture only gained 1·2 lb. a day. Native pastures were in excellent condition.

On the same property in a 35-day period from December 12, 1958, bullocks with access to a cowpea/white panicum crop gained 2·7 lb. a day. On native pasture they gained only 1·9 lb. a day.

NOTE: Cowpea is a legume. Inoculate seed with culture to ensure efficient nodulation. It is a high protein crop. It increases the nitrogen status of soils.

(ii) **Sudan grass** (Sweet Sudan grass). Sudan grass is a sorghum and as such there is a slight risk of prussic acid poisoning. Plant only on soils well supplied with nitrogen—the black or scrub soils. Planting time: Sept. to Jan.; available for grazing from 6 to 10 weeks after sowing.

Sowing rate: 8 to 10 lb. to the acre through a seed box.

To obtain a better balanced fodder it is preferable to mix sudan grass with cowpea.

Sudan tends to regenerate in the spring and will provide some grazing in the second year. Yields of green feed at 8 to 10 tons to the acre are common. The crop is suitable for conservation as hay or silage.

(iii) **Sweet sorghum** (Varieties—Sugardrip, Honey, Italian, &c.) Some risk of prussic acid poisoning exists here. The normal precautions should be taken.

It is suitable for soils well supplied with nitrogen, for example, black forest or scrub soils.

Planting time: Sept. to February; available for grazing in 2 to 4 months.

Sowing rate: 8 to 10 lb. to the acre.

Sweet sorghum is not commonly used for grazing. Sudan grass is preferred, but yields of sweet sorghum often exceed 10 to 15 tons to the acre. Yields in excess of 20 tons have been recorded.

(iv) **Sorghum almum** or Columbus grass. It is another sorghum with a slight risk of prussic acid poisoning. Good yields are possible only on soils well supplied with nitrogen—black soils and scrub soils. It is perennial in habit, while sudan grass tends to be a biennial only.

Sorghum almum is not impressive on poor coastal or forest soils.

Plate 5

A Close-up of a Well-Grown Crop of Cowpea and White Panicum.
A crop such as this at "Culcraigie" was planted on December 20, 1957, and on March 6 yielded 14 tons of green material to the acre.

The crop has been grown with lucerne in the Taroom, Wandoan districts.

Planting time: January to early March.

Sowing rate: 5 lb. to the acre with 1 lb. lucerne to the acre.

At the time of writing, Columbus grass is still on the prohibited seed list in Queensland because of the difficulty in distinguishing its seed from Johnson grass which is one of our worst pests in farming districts. However, it has now been removed from the prohibited list in New South Wales.

(v) **Lucerne.** Lucerne is a perennial leguminous crop which can be grown on most soils west of the coast range. In coastal areas, it grows successfully on well-drained alluvial flats only. It is the most valuable hay crop but is also important for grazing, and as a legume in sown pasture mixtures.

For hay crops—see Departmental literature.

Time of Planting lucerne for grazing: March or April.

Sowing rate: 1 to 5 lb. to the acre; 1 to 2½ lb. gives excellent results in dry areas; 10 to 12 lb. to the acre under irrigation.

Grazing: Exercise care with bloat; ½ to 1 acre of lucerne for each beast grazed in conjunction with native pasture.

At Brian Pastures between 8-5-1958 and 25-8-1958, stock with lucerne available gained 86 lb. Stock on native pastures lost 21 lb. in the same period. With supplementary lucerne, stock made steady gains of 1·3 lb. a day during the last 10 weeks of the period.

(*b*) *Winter growing Fodder Crops.*

Plant on well prepared land, in autumn or early winter rains.

(i) **Oats** is the most favoured crop. On the coast it is best planted on land previously cropped to cowpeas. On black or scrub soils, the crop is planted following a summer fallow to trap moisture and build up nitrogen.

Varieties: Use only rust resistant varieties. Bovah and Benton are popular. A new variety, Saia, is on the market. Bovah is satisfactory in the Burnett.

Planting rates:

30 to 40 lb. on droughty soils.

40 to 50 lb. on good agricultural soils.

Planting time: Late February to June.

Grazing: Commence to graze when plants are firmly established and before seed-heads show. The best results are obtained by grazing and then spelling to allow for regrowth. Crops may be available for grazing between May and October.

Results: Yields depend on soil nitrogen and moisture. On black soils at "Jubilee" in 1958, two groups of animals between 1-7-1958 and 13-10-1958 recorded gains of 2·4 lb. a day and 3·7 lb. a day respectively at 1 beast to the acre. Between June and October, 1959, (oats badly rusted) 47 head gained an average of 1·4 lb. a day at 1 beast to the acre.

On the "Culcraigie" sandy soils, weaners from 1-7-1959 to 8-9-1959 gained 1·5 lb. a day. On native pasture, the gain over the period was 0·2 lb. a day. Between 31-5-1960 and 12-7-1960, 40 weaners on 20 acres of oats *gained* 0·9 lb. a day. Those left with their mothers on native pastures *lost* 0·24 lb. a day.

(ii) **Wheat.**—Short grazing season only.

Varieties: Long growing season varieties, such as Lawrence.

Planting time: March to June.

Seeding rate: 45 to 50 lb. to the acre.

Plate 6.

Oats Growing on Poor Sandy Soil at "Culcraigie" in July, 1959.

Plate 7

Lucerne Regrowth in a Rhodes Grass/Lucerne Mixture at "Brian Pastures" in December, 1957.

(iii) **Barley** provides little regrowth but may be planted late in the season to provide some spring grazing.

(iv) **Green panic—centro—phasey bean.** A suitable mixture for coastal soils with fertilizer applications.

Planting time: January to March.

Sowing rates: Green panic 3 to 5 lb. to the acre; Centro 4 lb. to the acre; Phasey bean ¼ lb. to the acre.

The pasture can be used for supplementary grazing between April and August and again in early summer. Under continuous grazing, it should carry 1 beast to 3 to 4 acres.

(v) **Scrobic—centro—phasey bean** is suitable for coastal soils, including soils subject to temporary waterlogging, with fertilizer.

Planting time: January to March.

Sowing rate: Scrobic, 2 to 3 lb. to the acre; Centro, 4 lb. to the acre; Phasey bean, ¼ lb. to the acre.

It is satisfactory pasture, extremely palatable at all stages of growth.

(vi) **Rhodes grass—centro—phasey bean.** This has been used with success at Rodd's Bay. It may have a wider application.

Planting time: January to March.

Sowing rate: Rhodes grass, 4 to 5 lb. to the acre; Centro, 4 lb. to the acre; Phasey bean, ¼ lb. to the acre.

(vii) **Green Panic—Molasses grass—centro—Townsville lucerne.**

Suitable for sandy coastal soils.

Planting time: January to March.

Sowing rate: Green panic 3 lb. to the acre; Molasses grass ½ lb. to 1 lb. to the acre; Centro 4 lb. to the acre; Townsville lucerne, 1 to 2 lb. to the acre.

(Phasey bean is subject to nematode attack on sandy soils.)

(viii) **Para grass** is used on wet or waterlogged soils in coastal districts. It is extremely palatable, and nutritious.

Plant by runners, roots or cuttings in September to October or January to February. Protect from stock.

(*d*) *Townsville lucerne* occupies the unique position of being the only introduced legume to establish successfully in native pasture. It is used with sown pastures in coastal districts.

Planting time: October to February.

Sowing rate: 1 to 4 lb. to the acre.

Note: Establishment is improved by renovation, using disc or tined implements. It is a heavy seeder. The density of the initial stand will increase. Townsville lucerne offers the one means of considerably improving the quality of native pastures in coastal districts.

(*e*) *Irrigated Pastures*

When conditions are suitable and high priced stock (for example, stud bulls) are grazed, irrigated pasture may be the means of providing very high quality fodder throughout the year.

Irrigated pastures are a separate study in establishment and management. Water requirements are high.

A suitable mixture may include:

Perennial prairie ..	5 lb. to the acre
H. I. rye-grass ..	4 lb. to the acre
Phalaris	4 lb. to the acre
Ladino white clover	2 lb. to the acre
Lucerne	1 lb. to the acre

Mixtures may be used at 2 beasts to the acre on a year-long basis. At "Eidsvold" Station, 20 acres fed 80 bulls from October to March in 1959-1960.

Establishment Methods

In the grazing districts the successful establishment of crops or sown pastures depends on the complete destruction of the native or weed species. There should be no competition for moisture or plant foods by unwanted plants.

Suitable seedbed conditions can be achieved by—

(*a*) A scrub burn

(*b*) Cultivation

Varieties: Cape or Skinless. Skinless has given better results towards the central districts.

Planting rate: 50 lb. to the acre.

(*c*) *Sown Pasture Mixtures*

(i.) Buffel grass and lucerne.

(ii.) Green panic and lucerne.

(iii.) Rhodes grass and lucerne.

The mixtures are suitable on the black (basalt derived) soils and on the scrub soils. They will persist for at least 5 years. Longer periods have been recorded with careful management.

Planting time: January to March.

Seeding rates Forest soils: Buffel grass 3 to 5 lb. to the acre and lucerne 1 to 2 lb. to the acre; Green panic 3 to 5 lb. to the acre and lucerne 1 to 2 lb. to the acre; Rhodes grass 3 to 5 lb. to the acre and lucerne 1 to 2 lb. to the acre.

Seeding rate of grass depends on quality of seed. Good strikes have been recorded at 1 lb. to the acre on newly burnt scrub land.

Grazing management: The pasture mixtures should be grazed lightly during the first year. Rotational grazing, 2 weeks on and 6 to 8 week off, ensures the persistence of lucerne. A suggested stocking rate is 1 to 4 acres on a year-long basis.

Some results:

TABLE 1

WEIGHT CHANGES FOR 5 GROUPS OF ANIMALS

" *Brian Pastures* " *Pasture Research Station*

lb./Liveweight per acre

Group	Period	Rhodes Grass + Lucerne	Green Panic + Lucerne	Buffel Grass + Lucerne	Native Grass
1	7-1-55— 20-1-56	112·0	116·2	122·9	36·0
2	20-1-56— 11-5-56	40·3	34·4	43·4	12·7
3	11-5-56— 14-9-56	20·8	33·4	34·3	—8·8
4	14-9-56—22-11-57	50·8	93·5	83·2	25·4
5	22-11-57— 15-8-58	50·2	56·5	68·0	43·5
	Totals	274·1	334·0	351·8	109·7

On sandy soils in the Burnett, trials suggest Biloela buffel grass and lucerne will be satisfactory.

Cultivation implies the use of machinery and certain costs are involved.

Minimum machinery required (1960 figures):

	£	£
Medium horsepower tractor	1,350	
Chisel plough (complete)	265	
Seed box	150	
Total	1,765	
Offset disc cultivators are desirable	185	
		1,950

The necessary equipment can be purchased for less than £2,000.

As a guide, a set of standard operating costs are presented. (Details will differ slightly with make of power unit, fuel costs and location).

Tractor Operating Costs can be summarised as follows, assuming that the tractor and equipment have a life of 8,000 hours or 10 years.

	Per hour *s.*	*d.*
Fuel—1 gal. dieselene per hour at 2s. 6½d.	2	6·5
Crankcase oil—2½ gal. every 200 hours at 10s. 3¼d. gal.		1·54
Air cleaner oil—1 pt. every 50 hours at 1s. 6d.		0·36
Element for oil filter every 500 hours at 16s. 4d.		0·39
Elements for fuel filter every 100 hours at 28s. 4d.		0·34
Top up oil and grease every 10 hours at 1s. 6d.		1·80
New tyres and tubes every 3,000 hours at £180	1	2·40
Repairs and maintenance 5%	1	8·20
Depreciation at 10%	3	3·84
Interest on Capital 5% on first year on £1,348 to 5% on £135 in the 10th year	1	1·0
Total	10	2·37
Tractor driver's wages and keep at £16 a week	8	0
Total	18	2

Chisel Plough and Seed Box Costs: Capital costs are £413 and supposing they are used for the life of the tractor only—

	Per hour *s.*	*d.*
Depreciation at 10%	1	0·4
Interest on capital at 5% flat rate		6·0
Repairs and maintenance at 5% flat		6·0
Total	2	0·4

The cost of operating the tractor with attached chisel plough and seed box will be £1 0s. 2·4d. per hour.

The 7 ft. implement should work at the average rate of 2½ acres an hour.

Cost per acre = £1 0s. 2d. ÷ 2½
= 8s. 1d. or say 8s. an acre.

To prepare new land after native pasture has been burned, three workings may be necessary—

	£	*s.*	*d.*
Cost per acre	1	4	0
Cost of seeding	0	8	0
Cost of seed			
10 lb. cowpea at £2 5s. 6d. per bushel	0	7	7
6 lb. white panicum at 9d. per lb.	0	4	6
	2	4	1

The cost of land preparation and planting = £2 4s. 1d. an acre.

The objects of cultivation or tillage are:

1. To prepare a suitable seedbed.
2. To protect the crop from competition.

Tillage

(*a*) Destroys and prevents the growth of weeds.

(*b*) Conserves soil moisture by means of a surface mulch of loose soil free of weeds.

(*c*) Incorporates stubble and other organic matter with the soil so that it is decomposed and plant foods are liberated for the next crop.

(*d*) Aerates the soil, which helps in decomposition.

(*e*) Reduces the soil to a structure suitable for the planting and germination of the crop seeds.

The beneficial effects are physical, chemical and biological.

Trials at "Brian Pastures" and elsewhere over a number of years have demonstrated that it would be a waste of time and money to sow on anything but a well-prepared seedbed.

Establishment of Summer-growing Crops

For September-October plantings, commence preparation in July. Burn native pasture. Plough to destroy the native plants. Chisel ploughing is satisfactory. Some prefer to use offset discs first and then the Chisel plough and sweeps.

Work on the contour so that the ground is left in a moderately rough condition with tine marks following the contour.

Three or more workings may be required depending on soil type.

Plant, using a combine, or chisel plough with a mounted seed box. Soil spill through the tines will provide a satisfactory cover on most soil types.

For December, January plantings continue working the soil to control weed growth.

Establishment of Winter-growing Crops

(*a*) Following cowpeas, till the soil sufficiently to prepare a seedbed. On sandy soils, one working only may be necessary. Provided soil moisture is adequate, oats can be seeded into cowpea stubble.

(*b*) On black or brown soils in dry areas, plough and leave land in a condition to absorb moisture during summer months. Control weeds and prepare seedbed by successive workings until a surface mulch of about 2 in. remains. Plant with a combine or mounted seed box on rains after the end of February.

Pasture Establishment

The two schools of thought are:

(*a*) Prepare as for a summer crop and plant in January to March;

(*b*) Plant only on land which has previously been cropped.

Pre-cropping is preferable. It ensures the destruction of native grasses which have germinated with the preceding crops. A seedbed more suited to costly small pasture seeds is the result. Competition from regenerating native species is reduced.

A summer crop-Winter crop-Summer crop-pasture sequence is generally satisfactory. The pasture mixture may be sown into the tilled cowpea stubble in the January to March season of the second year.

Pasture seed *should not be planted deeply*; ½ in. to 1 in. cover is satisfactory.

Mr. R. G. Wilson, Adviser in Agriculture at Toowoomba, has published an excellent article "Machine Sown Pastures on the Darling Downs", (Advisory leaflet No. 411) in which information on the preparation and use of a combine for planting is given.

Satisfactory results have been obtained by using a seed box mounted on a chisel plough.

Buffel grass will not plant through conventional machines. Special planters are on the market.

Pastures may be successfully established in two stages. Lucerne may be planted at 1 to 2 lb. to the acre with oats through every seventh run of the drill. Graze the oats crop, then cultivate between the rows of lucerne and drill in green panic or Rhodes grass in the following summer. Mr. E. Kirk near Gayndah successfully established a pasture in this way.

Farmers have planted Rhodes grass and lucerne or green panic and lucerne with crops of grain sorghum or maize. Success is achieved in seasons of high rainfall on fertile soils. The method is not recommended.

Land intended for irrigated pasture should be pre-cropped for at least one season. Every effort should be made by cultivation or grading to level the surface for most efficient watering. A fine firm seedbed is required.

Townsville lucerne may be broadcast directly onto native pasture in coastal districts. The seed is costly (about 10s. lb.) and the establishment and spread are slow if this method is used.

A trial showed that a light renovation of the native pasture at planting time increased establishment five times in the first year. The stand increased to 20 times the number of plants in the second year.

Plate 8

Irrigated Pasture at "Eidsvold" Station in January, 1960.

A recommended procedure is to burn native pastures in the spring and broadcast in front of a chisel plough. The treated paddock should be grazed during the summer months to control native grasses. Shading may retard the growth of young seedlings.

Successful establishment of crops and sown pastures depends on the application of good farming practice. There are no short cuts.

Management Techniques and Land Use Systems

Land utilization has been influenced by the type of country or the fodder it produces; breeding country, growing country, fattening country are common terms.

If crops or sown pastures are grown it may be possible to modify the composition of the beef herd and so adopt a different system of land use.

Sown Pastures

A number of experiments conducted over a wide range of conditions show no increase in production as a result of rotational grazing *except* when one component (lucerne) is susceptible to continuous grazing.

Mr. N. H. Shaw, of the Commonwealth Scientific and Industrial Research Organisation, has shown that it is necessary to observe some form of rotational or deferred grazing to maintain lucerne in a Rhodes grass-lucerne pasture. A system of rotational grazing in which paddocks are grazed for 2 weeks and spelled for 6 to 8 weeks is satisfactory.

When sown pastures are used as a supplement to the native pastures, the summer growth of January to March might be saved for April to July grazing. The pastures may be spelled until October and grazed lightly until December.

Some provision should be made to remove cattle from crops or sown pasture during periods of excessive wet. Avoid damage due to compaction and trampling.

Areas of sown pasture or crop should exceed 20 acres if possible. With tractor tillage, areas of 50 acres or more are economical; fencing, water and cultivation costs per acre are reduced. Land available and number of stock to be fed are considerations.

Rate of stocking is a most important factor in management. It is governed to some extent by seasons. In the Burnett (subcoastal), 1 adult to 4 acres is satisfactory in most years on forest country; 1 to 3 on scrub country.

On coastal areas 1 beast to 3 acres could be satisfactory. If deferred grazing is practised and summer growth is saved for April to July grazing, the pastures may be used at 1 beast to 1 acre for this period with a 1 to 3 stocking for the October to December period, again influenced by rainfall.

Understand that these figures are a guide only and actual stocking rates will depend on your experience and knowledge of the vigour of the pasture and on seasonal conditions.

Grazing Crops

At "Culcraigie", on sandy soils, summer cowpea mixtures have been grazed continuously for 60 days at a beast and a half to the acre, with a lighter second grazing. In the coastal areas. similar crops have been grazed at 2 beasts to the acre during the December to January period.

Oats crops will vary in yield with growing conditions. It is wise to commence grazing at 1 beast to 1 acre and increase the stocking rate as required to control growth. The grazing season on oats is probably lengthened if the crop can be grazed at intervals to allow for regrowth between grazings.

A Cropping System

Native pastures supply a satisfactory ration between October and April. Supplementary feed is required for the periods April to June and June to October.

A two-paddock system will provide the supplement in most years. An area of sown pasture used in conjunction with crops will improve the efficiency of the system.

December to February grazed crops and crops grazed between April and July can be used in conjunction with the sown pasture.

A cropping system is presented in diagrammatic form:

TABLE 2

A FODDER CROP GRAZING SYSTEM

for 50 head of adult cattle

50 acres	
Early Paddock—25 acres	*Late Paddock—25 acres*
September–October—Plant cowpeas and white panicum	December–January—Plant to cowpeas and sweet sudan
December to February—Graze	April, May, June—Graze
March–April—Plant oats	June–July—If good rains fall, plant barley
June–September—Graze oats	If rains poor, graze sudan grass stubble in the spring
Repeat or	*Repeat*
September–October—Plant to cowpea and white panicum	
January—Plant to pasture	

The system allows for progressive property development. Each year the early paddock could be planted to sown pasture and a new area brought into cultivation. In this way the carrying capacity of the property might be gradually increased while maintaining production per animal unit.

"Unit Development"

The knowledge and experience accumulated to date suggests a practical land development system which could have immediate application and meet the needs of graziers.

The system involves the establishment of "units" or small paddocks within the larger grazing areas. It envisages islands of highly developed and intensively managed land within the property boundary.

Units will be more efficiently used if an area of native pasture with water and shade can be fenced in with the crop and sown pasture plots. If water is not available the unit will serve the large paddock by simply opening gates to give direct access to stock as required.

The minimum equipment required has already been detailed.

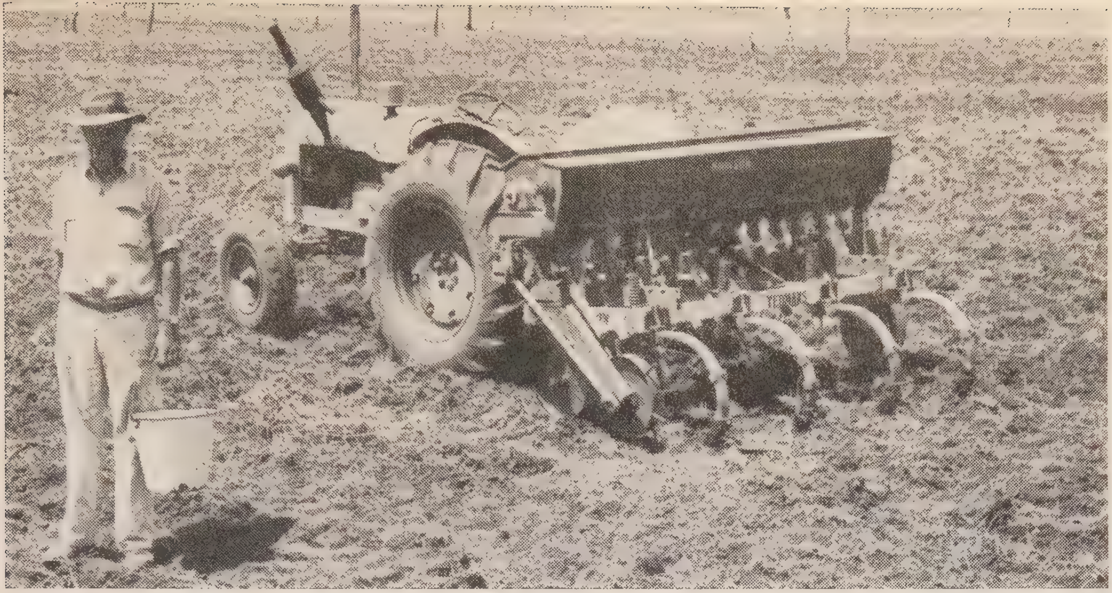


Plate 9

Suitable Equipment for Establishing Crops and Sown Pastures.

The development of each unit will follow a well-defined pattern and proceed in a logical sequence which must fit with stock work and normal property management.

The first plot in a unit is treated as follows:

(i.) Commence clearing in the winter–spring of the first year after the burn. It is preferable on most properties to delay a year between clearing and the initial ploughing.

(ii.) Fence during the winter of the second year.

(iii.) First crop: burn as early as possible in the winter and commence cultivating so that land is ready to plant in September.

(iv.) Second crop: Plant between the end of February and June for winter, spring grazing.

(v.) Third crop: Plant on the oats stubble after suitable cultivation in October.

(vi.) Sown Pasture: Plant in January, February of the fourth year. Stages (i.) to (iii.) could be attempted in the first year if sufficient labour is available.

The second or further plot in a unit may be brought into production by following the sequence, as capital and labour are available.

The size and composition of the unit will be governed by topography, soil and the number and *class* of stock to be supplemented.

Units in breeder paddocks may consist of three plots or paddocks of sown pasture. Breeders should maintain condition during the winter–spring months.

A unit in a bull paddock may consist of two plots of sown pasture and one for annual crops.

A unit in a weaner paddock may consist of one plot of sown pastures with two plots for annual crops, a higher quality fodder being required for this class of stock.

The actual crops or sown pasture mixtures in use will depend on property location.

A property well developed along these lines will have overcome to a large extent the usual seasonal variations in production. The grazier will then be in a position to strengthen his position further. He has available sown pasture and crops of high quality. In seasons of lush growth the surplus may be conserved as hay or silage.

The final picture is of a property well fenced and well watered, the native pastures improved by judicious timber treatment and the inclusion of Townsville lucerne where practicable. There are sufficient units of crop and sown pasture well distributed on the property. Surplus fodder from the units is conserved there for use in times of drought.

Tuberculosis-Free Cattle Herds

(As at 30th November, 1960)

Aberdeen Angus

Crothers, G. H. & H. J., "Moorenbah", Dirranbandi
Elliott, A. G., "Ooraine", Dirranbandi
Mayne, W. H. C., "Gibraltar", Texas

A.I.S.

Cox, T. L. & L. M. J., Seafield Farm, Wallumbilla
Crookey, J., Arolla A.I.S. Stud, Fairview, Allora
Davis, W. D., "Wamba", Chinchilla
Dennis, L. R., Diamondvale A.I.S. Stud, Mundubbera
Edwards Bros., "Spring Valley" A.I.S. Stud, Kingaroy
Evans, E. G., Lauraven A.I.S. Stud, Maleny
Green, D. B., Deloraine A.I.S. Stud, Fairdale
Heading, C. A., "Wilga Plains", Maleny
Henry, Mrs. K., & Sons, P.O. Box 4, Cambooya
Henschell, W., "Yarranvale", Yarranlea
H. M. State Farm, Numinbah
Littleton, H. V., "Wongalea", Bowenville
Marquardt, A. C. & C. R., "Cedar Valley", Wondai
McShane, A. H., Handford Road, Zillmere
Mears, G. S. & E., "Morden", M. S. 755 Toogoolawah
Moore, S. R., "Sunnyside", West Wooroolin
Neale, D. G., "Groveley", Greenmount
O'Sullivan, Con., "Navillus", Greenmount
Pinwill, A. A., Gaylands A.I.S. Stud, Gayndah
Power, M. F., "Barfield", Kapaldo
Messrs. Mitchell and Mulcahy, Rosenthal
Queensland Agricultural High School & College, Lawes
Radel, R. R. & Sons, "Happy Valley", Coalstoun Lakes
Roche, C. K., Freestone, Warwick
Sanderson, W. H., "Sunlit Farm," Mulgildie
Schloss, C. J., "Shady Glen", Rocky Ck., Yarraman
Scott, M. E. & E., "Wattlebrae" A.I.S. Stud, Kingaroy
Scott, W. & A. G., "Walena" A.I.S. Stud, Blackbutt
Shelton, R. A. & N. K., "Vuegon" A.I.S. Stud, Hivesville, Murgon
Estate Sokoll, A. H., "Sunny Crest", Wondai
Sperling, G., "Kooravale", Kooralgin, Cooyar
Sullivan Bros., "Valera", Pittsworth
Sullivan, D., "Bantry", Pittsworth
Sullivan, F. B., "Fermanagh", Pittsworth
Thompson, W. H., "Alfavale", Nanango
Webster, A. H., "Millievale", Sabine, via Oakey
Wieland, A. W., "Milhaven", A.I.S. Stud, Milford, via Boonah

Ayrshire

Dudgeon, C. E. R., Marionville Ayrshire Stud, Landsborough
Dunn, T. F., "Alanbank", Gleneagle
Goddard, B., Inverell, Mt. Tyson, via Oakey
Holmes, J. L., "Benbecula", Yarranlea
Mathie, E. & Son, "Ainslie", Maleny
Scott, J. N., "Auchen Eden", Camp Mountain
Zerner, G. F. H., "Pineville", Pie Creek, Box 5, Post Office, Gympie

Friesian

Behrendorff, E. C., Inavale Friesian Stud, M.S. 786, Boonah
Macdonald, S. E. G., "Freshfields", Marburg
Morrison, E. J., Cedar Creek, via Closeburn
Naumann, C. H., "Yarrabine", Yarraman
Pender, D. J., Lytton Road, Lindum
Stumer, A. O., Brigalow, Boonah

Guernsey

Doss, W. H., Degilbo, via Biggenden
Fletcher, A. B., "Cossart Vale", Boonah
Holmes, C. D. (owner Holmes L. L.), "Springview", Yarraman
Johnson, G. L., "Old Cannindah", Monto
Miller, G., "Armagh Guernsey Stud", Armagh, M.S. 428, Grantham
Ruge, A. & Sons, "Woowoonga", via Biggenden
Scott, C., "Coralgrae", Din Din Rd., Nanango
Swendson, A. C., Coolabunia, Box 26, Kingaroy
Wissemann, R. J., "Robnea", Headington Hill, Clifton

Jersey

Beckingham, C., Trout's Rd., Everton Park
Birt, W. C. M., Pine Hill Jersey Stud, Gundiah
Borchert, Mrs. I. L. M., "Willowbank" Jersey Stud, Kingaroy
Burrows, R. N., Box 23, Wondai
Bygrave, P. J. L., The Craigan Farm, Aspley
Carpenter, J. W., Flagstone Ck., Helidon
Conochie, W. S. & Sons, "Brookland", Sherwood Rd., Sherwood
Crawford, R. J., Inverlaw, Kingaroy
Farm Home For Boys, Westbrook
Fowler, P. & Sons, "Northlea", Coalstoun Lakes
Harley, G., "Hopewell", East Nanango
H.M. State Farm, Palen Creek
Hutton, D. R. & M. E., "Bellgrath", Cunningham, via Warwick
Johnson, H. G., Windsor Jersey Stud, Beaudesert
Lau, J. F., "Rosallen", Goombungee, Toowoomba
Matthews, E. A., "Yarradale", Yarraman
McCarthy, J. S., "Glen Erin", Greenmount, Toowoomba
Meier, L. E., "Ardath Stud", Boonah
Noone, A. M. & L. J., "Winbirra", Mt. Esk Pocket
Porter, F., Conondale
Q.A.H.S. & College, Lawes
Ralph, G. H., "Ryecome", Ravensbourne
Scott, Est. J. A., "Kiaora", Manumbar Rd., Nanango
Semgreen, A. L., "Tecoma", Coolabunia
Seymour, B. T., "Upwell" Jersey Stud, Mulgildie
Smith, J. A. & E. E., "Heatherlea" Jersey Stud, Chinchilla
Tatnell, W. T., Cedar Pocket, via Gympie
Toowoomba Mental Hospital, Willowburn
Verrall, F. W., "Coleburn", Walloon
Weldon Brothers, "Gleneden" Jersey Stud, Upper Yarraman

Poll Hereford

Anderson, J. H. & Sons, "Inverary", Yandilla
Hill, W. W., Mathalla
Hutton, D. R. & M. E., "Bellgrath", Cunningham, via Warwick
Maller, W., "Bore View", Pickanjinnie
Maller, W., "Bore View", Gowrie Junction
McCamley, E. W. G., "Eulogie Park", Dululu
Wilson & McDouall, Calliope Station, Calliope

Poll Shorthorn

Leonard, W. & Sons, **Welltown, Goondiwindi**

Plate 1: Elephant Grass.

Elephant Grass Fills a Fodder Gap

By T. K. KELLY and W. J. DRAPER, Agriculture Branch.

Fine stemmed elephant grass for grazing is filling a fodder gap for a dairy herd in the Millaa Millaa district on the Atherton Tableland.

Mr. L. Wallwork, a dairy farmer of Innisfail Road, Millaa Millaa, has, from a 1½ acre planting, provided supplementary grazing for a 48 cow herd all through the year.

The topography of this district is unfavourable for annual fodder crops and where limited areas can be cultivated it is desirable to revert to pastures after one year to prevent soil erosion.

The area of elephant grass at Mr. Wallwork's property was established as a Commonwealth Dairy Industry Extension Grant project to demonstrate the value of this species for supplementary grazing in a district where there is excessive dependence on pastures.

In the Millaa Millaa district the rainfall and soil type are very favourable for elephant grass but for high production attention must be given to soil fertility and management.

Average annual rainfall is 103 in. with fairly high intensity over the summer months and prolonged periods of misty rain during the autumn.

The soil, which is of basalt origin, is deep friable and permeable. It has a red-brown surface changing to bright red in the subsoil. Soil fertility was high following the clearing of rain forest about 50 years ago but as could be expected with a porous soil under high rainfall conditions there has been a decline in soil fertility, the main deficiency being nitrogen.

The present stocking capacity of the pastures is approximately one beast to 4 or 5 acres.

Management

At the time of planting the elephant grass in December, 1958, a fertilizer mixture of equal parts of sulphate of ammonia and superphosphate was applied at the rate of 2 cwt. to the acre This was followed by an application of 4 cwt.

to the acre in October, 1959. Since the grass was established, Mr. Wallwork has spread all the manure from his dairy premises on the area.

A row spacing of 4 ft. was used at planting but the inter-row spaces have now filled with the grass.

After establishment, the first grazing was delayed to permit the development of strong crown and root growth. Slashing was then required to reduce the top growth but no further cutting has been necessary.

The grass has not been frosted though the district is subject to a few light frosts in July or early August.

Grazing has been intermittent, using an average herd of 48 dairy cows. During the summer months, up to four grazings a month have been obtained with a reduction to two a month during the colder part of the year. On all occasions the area has been used as a night paddock mainly for convenience but over a period this should have an effect on soil fertility.

The grazing has been regulated to keep the elephant grass at a height of 18 to 24 in., which has induced the production of dense leafy growth from the stools. The young foliage has a relatively high crude protein content.

Following a night on the elephant grass, Mr. Wallwork's cows have shown a consistent increase in the morning's milk production to the extent of 2 to 3 gal. from the herd.

Altogether, Mr. Wallwork has found that:

(*a*) Elephant grass has a high carrying capacity when used as a supplementary grazing crop.

(*b*) Farmyard manure or chemical fertilizers or a combination of both are desirable for maximum growth.

(*c*) While elephant grass will grow under a wide range of conditions, it is particularly suitable for the Millaa Millaa disdict in which annual cropping practices are impracticable on most farms.

New Tobacco Curing Barn

A New Zealand-designed tobacco barn promises to help Queensland growers get more uniform and cheaper curing of their leaf.

The Director of the Division of Plant Industry in the Department of Agriculture and Stock (Mr. W. J. S. Sloan) said that the Central Tobacco Advisory Committee had formed a special sub-committee last year to examine tobacco curing methods. A decision to build and test the New Zealand type of tobacco barn in Australia followed the sub-committee's studies.

A barn of this type, now being built at Myrtleford in Victoria, will be tested this harvesting season. If successful, another will be built at the Parada Tobacco Experiment Station in time for the next harvest. It will be used as a demonstration for north Queensland growers.

Forced Draught

The New Zealand-type barn employs a forced draught method of curing. This involves forcing hot air into the barn at the top by means of a fan, so that it passes downwards through the leaf. This is the reverse of the present Queensland method in which hot air, not under pressure, is introduced at the bottom of the barn and is allowed to find its way to the top.

Tests have shown that the down-draught barn gives more uniform and generally better quality leaf than other barns. It also has more uniform conditions of temperature and air movement, and there are no cold corners. It has a greater capacity, holding about 75 per cent. more leaf. Curing time is reduced by up to 24 hours and the saving in fuel costs can be as high as 33 per cent. In properly-constructed down-draught barns the fire risk is lower than in the up-draught type.

He added that it is possible to modify the existing up-draught types of curing barns to down-draught types. This will mean a great saving to growers if the down-draught method is suitable under Australian conditions and growers want to change over to that system of curing leaf.

Mango Growing in Queensland

By S. E. STEPHENS, Horticulturist.

The mango (*Mangifera indica,* fam. *Anacardiaceae*) is related to the tar tree and the cashew nut and, in common with these, possesses a caustic sap. It is probably native to south-eastern Asia.

The tree is a densely foliaged evergreen which grows to 50 or 60 ft. Some races are tall, upright growing and narrow, others have a round or oval head, and several have a broad base and a tapering, conical or pyriform top. The leaves are simple and entire, often up to 15 in. long and seldom more than 2½ to 3 in. wide.

The flowers are borne in large terminal panicles, the individual flowers being small (about a quarter of an inch in diameter) and either staminate (male) or perfect (bisexual). Fruit setting is more frequent near the tip of the panicle than on the primary laterals near its base, and the fruits are therefore frequently borne on an elongated stem.

Plate 1

Kensington Mangoes at Bowen. In the Dry Tropics mangoes are a distinctive feature on many properties either in block plantings or as single or double row plantings separating adjoining farms.

Fruits vary considerably in size, shape, colour, flavour and fibre content. Colour is extremely variable. Some kinds are a uniform yellow-green colour when ripe; others may be deep orange, straw-coloured, red, or display a combination of two or more of these colours. Although colour is a varietal character, environment effects the intensity of the colour within a variety. Flavour varies from insipidly sweet and fragrant to strongly acid and odoriferous. Fibre content depends largely on the structure of the seed. The greater the number and length of the fibres on the seed, the poorer is the eating quality of the fruit. However, a fruit without fibre lacks carrying quality.

The seeds of the mango are relatively large and disc-shaped. They may be monoembryonic (with a single embryo) and produce only one seedling, or polyembryonic (with several embryos). In the latter case, a number of seedlings develop from the one seed; one of these is derived from the fertilized ovule and the remainder grow from vegetative buds in the ovary. Varieties such as Kensington, which are polyembryonic in habit, may be propagated by seed, as the majority of the seedlings will be identical with the parent tree. Monoembryonic varieties must, however, be propagated by budding or grafting.

Races and Varieties

In Queensland, where the mango is propagated almost entirely from seed, several races are recognised. Of these, the most widely grown is that known as the "Common" mango, which grows along the whole of the eastern coast and exhibits uniform characters. The tree usually has an oval head, the foliage is dense and the leaves are of medium size. The fruit is long, always yellow-green in colour and thin-skinned, with a very fibrous but sweet and well-flavoured flesh.

A race which is often called the "Apple" mango is represented by the variety Kensington. The tree is oval in shape and the leaves have a characteristic sweet scent when crushed. The fruit weighs about 15 oz., and the fine-textured skin has a bright orange-yellow colour with a reddish-pink blush over the base and exposed faces of the fruit. It is grooved from the stem end to a projection on one side known as the nak. The flesh of the ripe fruit is thick, rich orange in colour, free of fibre and has a pleasant flavour. It is a mid-season variety.

Other races of minor importance exist in Queensland.

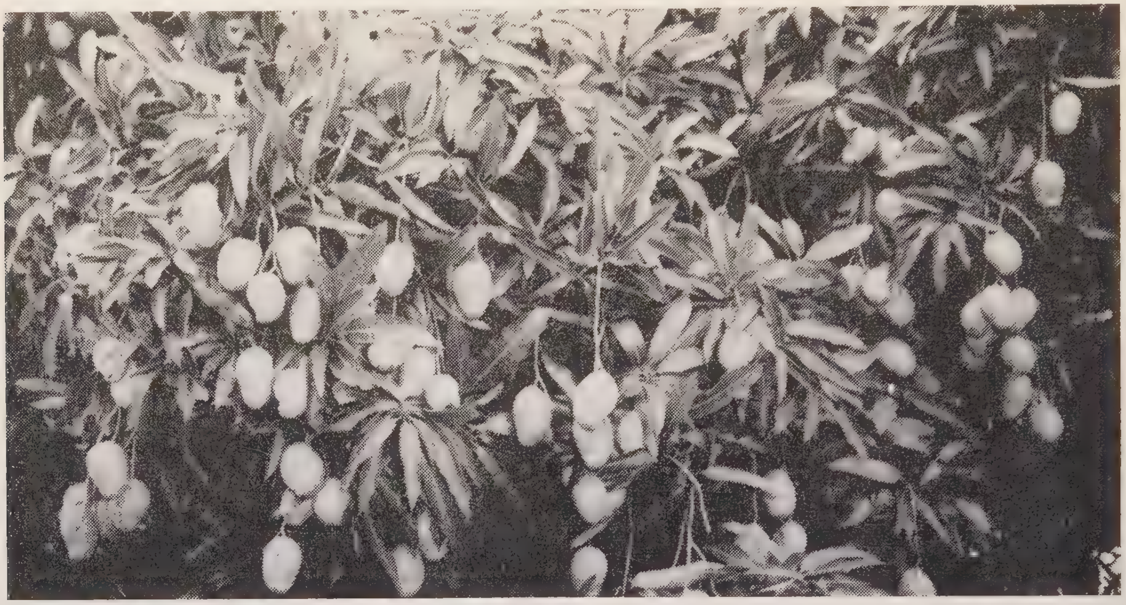


Plate 2

Portion of a Mango Tree in Crop. Given a season which is favourable for fruit set and normal development of the fruit, mango trees carry very heavy crops.

Climatic and Soil Requirements

The mango is a tropical plant and grows naturally in many parts of coastal Queensland. It is not frost-hardy, but in places where light frosts occur the tree usually can be established by giving it protection during the early years of its growth. When mature, it tolerates light ground frosts.

The tree thrives under the hottest conditions and the annual rainfall may vary between wide limits without adversely affecting the crop. Dry weather during flowering and the early stages of fruit development is, however, desirable.

The mango is grown on a wide range of soil types. In Queensland, it thrives on soils derived from decomposed granite, basalts and schists, and on alluvials and beach sands. Good drainage is essential and a stable water-table an advantage. The tree forages widely and deeply in a well-drained soil and this habit makes it very adaptable.

Propagation

Mango plants must be raised from seed and a special type of seedbed is used to restrict the development of the tap root. The seedbed is a frame about 8 in. deep with a floor of sheet iron or concrete. A medium to coarse sand may be used as the rooting medium. Plants raised in a seedbed of this type can be readily lifted without injury to the roots and have a fibrous root system which enables them to resume growth shortly after they are transplanted.

Mango seed must be fresh and is better not dried out before planting. Husking prior to planting is essential to prevent deformed root growth. As soon as possible after husking, the seeds should be planted in the seedbed with a 6 in. spacing each way between them. They must be set on edge with the convex edge on top and about three-quarters buried in the sand. A mulch of straw or some similar material should then be placed on the surface of the bed. The seedbed is completed by erecting a hessian or light bush shade about 3 ft. above it.

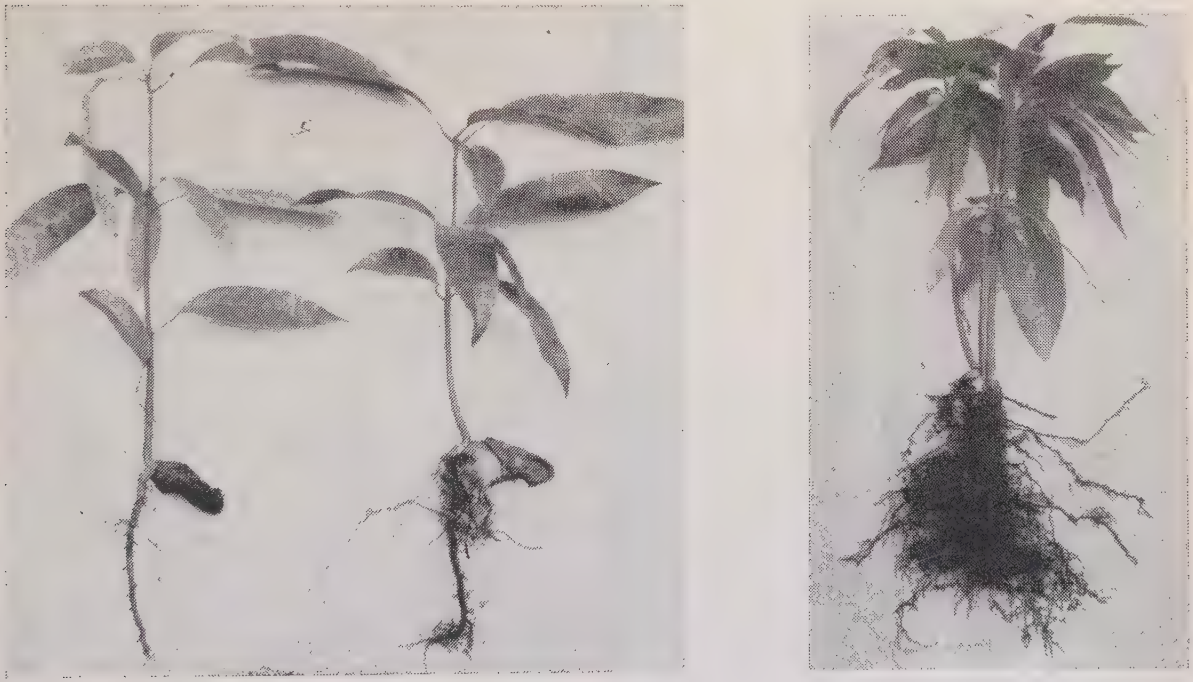
Sprouting of the seed commences in 8-14 days. About three weeks after germination, the shelter is gradually thinned to harden off the seedlings before they are transplanted to nursery rows or to their field positions. If they are to be grafted, it is customary to place them in nursery rows, but if the trees are to be grown as seedlings they should be planted directly into the orchard. If, however, they are too small for field planting, they may remain in the seedbed until they have matured their second flush of leaves, but no longer.

As stock plants for the production of grafted trees, polyembryonic races with a free habit of growth are preferred. The Common mango has been found quite suitable for the purpose.

Bud Grafting and Inarching

Budding is more difficult with mangoes than with many other fruit trees. Three methods have been used—the ordinary or inverted T bud, the Forkert bud, and the window bud. In window budding, the bud is held in close contact with the stock and there is little trouble from corky tissue under the bud, which sometimes causes an unsightly and weak union.

Under tropical conditions, budding may be carried out during a flush of growth after the buds have begun to swell but not later than a stage at which the new leaves are still only partly expended. A flush can be produced at any period of the year, except mid-winter, by applying a solution of 1 oz. of sulphate of ammonia in 1 gal. of water several days before commencing budding. Budwood appears to give the highest percentage of takes if it has been cut and stored in damp peat moss or wet sand for several days before use. Green wood of the second and third last flushes, and about three-eighths of an inch


(a) Plate 3 (b)

Seedling Mangoes. **(a)** Monoembryonic type which produces a single plant from each seed; **(b)** Polyembryonic type which produces several plants from a single seed. Seedling trees of the polyembryonic variety Kensington mostly resemble the parent and are widely grown in Queensland.

in diameter, is the best type of budwood. The latest flush should be discarded as it is often insufficiently mature.

In India, it has been customary for many years to propagate outstanding varieties of monoembryonic mangoes by inarching. Inarching is a laborious method of propagation and the graft union so made is not strong. The method is not favoured in Queensland.

Cultural Practices

As the mango grows to an immense size in the tropics on suitable soils, it is essential to allow plenty of room between the trees. A reasonable distance for planting is 40 x 40 ft., but on very good land the spacing may be increased to 50 x 50 ft. On poor soils and in areas with cold winter temperatures, tree growth is much less vigorous, and planting distances of 35 x 35 ft. may be safely employed.

If young seedlings are used for planting the orchard, the foliage should be reduced to about one-third by trimming each leaf, and the young tree is then set in a prepared hole. Shade from a small leafy branch pushed into the soil beside the young plant gives it some protection in hot weather.

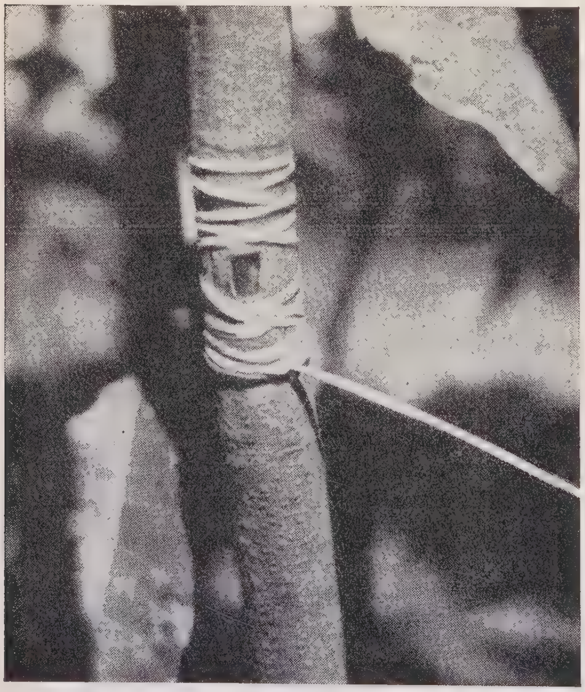


Plate 4

Window Graft in the Mango. This type of graft has proved suitable in Queensland for propagating monoembryonic mangoes, seedling progenies of which vary considerably from the parental type.

If budded trees or large seedlings are used in establishing the orchard, preliminary conditioning of the young plants is necessary. This should be carried out about 6 weeks before the scheduled planting date and consists of digging down beside each tree to a depth of about 12 in. and severing the tap root with secateurs to ensure a clean cut. If the trees have a forked tap root, both branches of the root must be cut. The hole is then refilled and the trees given a good watering. After a period of six weeks, the young trees should be carefully dug with a ball of earth on the roots and planted in the orchard. Shortening back the foliage to about half helps the establishment of the tree.

If the young trees have to be transported some distance and bare-root planting is unavoidable, the roots should be well puddled immediately the plants are dug and three-quarters of the foliage cut away. The trees are then planted in the usual way, provided with ample shade and watered liberally until they become established. Usually, there are more deaths in bare root planted trees than in balled trees.

The best time for transplanting mangoes is in the summer during the monsoonal wet season. At this period of the year there is ample soil moisture to promote growth; the atmospheric humidity is high and the tops are not subjected to desiccation during the difficult period of establishment.

The plants should be moved only between flushes of growth when the terminal shoots are dark green in colour.

The usual methods of cultivation are practised in the orchard. During the early life of the trees, small crops can be grown in the wide inter-row spaces. The cultivation required by these crops will maintain the land in good condition for the mango trees until they come into bearing.

After the trees have reached an age and size at which further inter-cropping is inadvisable, the soil should be protected by a cover crop.

Pruning

The terminal bud of the whipstick seedling is pinched out when it reaches about 3 ft. This is done to start the main frame of the tree. Failure to do this often results in a single straight sapling 15 to 18 ft. high. If pinching back has not been done at the correct time, it will be necessary to cut back the top just above a growth ring at the appropriate height. The shoots which then grow from the head of the tree at the next flush should be reduced to two or three to form the main branches. These in turn are pinched back when they have made 18 to 24 in. of growth to induce further branching.

The only pruning needed subsequently is the removal of weak shoots that grow in the centre of the tree, the thinning out of overcrowded branches and the shortening back of limbs that droop too close to the ground.

Pruning is carried out immediately after the fruit is harvested.

Fertilizing

Mango trees apparently require fairly large amounts of nitrogen during the early years of growth and relatively large amounts of phosphate and potash after fruiting commences. Complete fertilizer mixtures with a formula such as 5:8:10 should prove satisfactory for bearing trees in Queensland. The condition of the individual trees should, however, also be taken into consideration when deciding on the amount of fertilizer needed. Rates of application comparable with those in citrus (1 lb. per year of age) could be followed in the first instance.

Fertilizer applications shortly before and immediately after the summer wet season appear to give the best results and the total annual dressing (about 30 lb. to each tree in full bearing) should, therefore, be split fairly evenly between the two dressings.

Fruiting

In coastal North Queensland, there are two main bursts of flowering. These vary in different areas but normally occur some time in the June-July and the August-September periods. In subtropical Queensland and on the northern Tablelands, the flowering period is restricted to the spring months of August to October.

The mango tree usually begins to bear fruit 5 to 7 years after planting. However, the variety Kensington is extremely precocious when grown under good conditions and its first fruits are borne at 3 years.

Plate 5

Mango Blossom. In spring, the mango tree is a mass of blossom with flowering stalks on almost all terminals.

Four to 5 months usually elapse between flowering and fruit maturity. During the early stages of development, the fruit is normally a dark-green colour, but as it approaches full size the skin acquires the blush characteristics of the particular variety on the exposed cheek. During the short period of about 10 days before full maturity is reached, the fruit fills out rapidly.

Harvesting

Harvesting is not easy in a large mango tree, for the fruit must be picked carefully and placed gently into the picking boxes. Fruit gathered from the ground after it has been dislodged by shaking the tree is quite unsuitable for the fresh market. Fruit on the lower branches is harvested easily from a cart or truck and some of the higher fruit, which is often the best on the tree, can be picked from the inside by climbing into the branches. Part of the fruit is on the outermost tips of the branches, however, and special equipment is needed to reach it. A long, light rod fitted with a hoop and meshed bag at the end is useful. The hoop is narrowed to a V-shaped notch opposite its attachment to the rod and is set at an angle of about 45 deg. to the axis of the rod. The bag is slipped over the fruit from below and as it is withdrawn the fruit is caught in the notch and pulled free, dropping into the bag. The bag should be shallow and of small capacity as it is not possible to support the weight of more than four or five fruit on the end of the long rod and still operate it with ease.

The fruit must be handled with care both in the orchard and in the packing shed. Mango fruit bruises very readily and then breaks down rapidly.

Yields vary with the variety and the season. The Kensington variety, which is harvested in its entirety averages 4 bushels in trees 10 to 15 years of age. Trees over 25 years old yield up to 30 bushels.

Full-Scale Tests on Leucaena Glauca

Leucaena glauca, the potentially valuable fodder tree, will be tested extensively in northern and central coastal Queensland, announced the Director-General of Agriculture and Stock (Dr. W. A. T. Summerville). This summer, Agriculture Department officers will make trial plantings of high-yielding strains of Leucaena in frost-free districts with a rainfall of 30 in. and higher.

Dr. Summerville said this tree was planted in north Queensland in the early days, but never became a popular fodder plant. Interest was revived in 1953, when Mr. Hosaka of the University of Hawaii, visited Queensland. He told of the high value placed on Leucaena by Hawaiian ranchers who regarded it as a major cattle fodder plant.

Since then the C.S.I.R.O. has introduced and examined many varieties from various parts of the world. Their performance has supported the Hawaiians' confidence in this species. Seed of the better-yielding varieties has now been made available to the Agriculture Department for further testing.

Main criticism levelled against Leucaena glauca is that it contains an alkaloid that causes horses to lose the hair from their tails and manes, and sheep to shed their wool, if the plant provides a major portion of their diet. Cattle are not affected to any extent. Another problem is the strong tendency in favourable locations for the plant to grow into dense thickets impenetrable to stock. In fact, the early plantings on the far north coast have shown this tendency.

On the credit side, Leucaena glauca is a legume and provides fodder rich in protein. Cattle make remarkably fast weight gains and the plant will stand heavy grazing.

Mr. S. Marriott, Assistant Director of Agriculture in the Department, recently studied Leucaena and its management during a visit to Hawaii. He reported that ranchers using it have claimed liveweight gains up to 3 lb. a day and a stocking rate of two beasts to the acre.

In Hawaii, opinions on the management of work horses differed. Some ranchers kept their horses out of paddocks containing Leucaena, but others regarded the loss of tail and mane hair of little importance when matched against the valuable cattle feed the plant provided.

There were occasional reports that the calf drop was lighter if breeders were grazed heavily on Leucaena. Authorities of the Hawaiian Agriculture Department and the South Pacific Commission, however, advised that these reports were unconfirmed.

In old, thick stands, Mr. Marriott reported, management became a problem. Heavy rotary slashers were being used to cut back plants 8 to 10 ft. high and about 1 in. thick. Although this left dense stands of short stems in the paddocks which made stock work slow, the lush growth from the green panic and other grasses, together with regrowth from the cut-back Leucaena, provided extremely nutritious feed. Even when planted in rows, these free-seeding plants tended to thicken into small, scrubby patches unless properly managed.

Use These Formulations To Mix Your Own Poultry Rations

By B. W. MOFFATT, Adviser, Poultry Branch

Recommended formulations are given for rations for chickens, laying hens and breeding fowls. Their use by the poultry farmer will assist him in the mixing of his own poultry feeds.

Modern poultry farming has made the hen an egg-laying machine. She is no longer allowed to scratch in the fowlyard for her own natural food, for it has been found that making her eat a well-balanced concentrated diet will result in increased egg production. The same situation also applies to her chickens when destined to become table poultry. If they are not housed intensively and fed concentrated diets they take too long to reach a marketable weight.

Because of these trends towards intensive conditions, feeding has become one of the most important aspects of poultry husbandry. The rations used must contain all the nutrients necessary for growth, health and production. As fowls are particularly susceptible to vitamin deficiencies, the deletion of even one ingredient from the ration can lead to disastrous loss of production.

Many poultry farmers buy their poultry feed already prepared, but others prefer to mix it themselves. For those who formulate and mix their own mashes, a sound knowledge of certain basic principles in nutrition is necessary.

There are three main considerations in the formulation of a poultry ration:

The nutritive requirements of the bird.
The availability of the ingredients.
The cost of the ingredients.

Birds of different ages have different nutritive requirements. For instance, a laying bird does not need so much protein or vitamin B_2 (riboflavin) as a chicken, but can tolerate a more fibrous mash. Different rations, therefore, are made up for chickens, growers, layers and breeders.

Quite often special, more "forcing," rations are made up for broilers because of the faster growth required in this type of bird. Therefore, before formulating a ration, a table of the nutritive requirements of the bird should be consulted:

TABLE 1

RECOMMENDED NUTRITIVE ALLOWANCES FOR FOWLS

——	Chickens 1–8 Weeks	Growers 8–18 Weeks	Laying Hens over 18 Weeks	Breeding Hens
Minimum crude protein % ..	18·0	16·0	15·0	15·0
Maximum crude fibre %	7·0	7·0	7·0	7·0
Lime (CaO) % ..	1·4	1·4	3·15	3·15
Phosphoric acid (P_2O_5) % ..	1·4	1·4	1·75	1·75
Added salt % ..	0·5	0·5	0·5	0·5
Added manganese sulphate (oz. per ton)	6·0	6·0	6·0	6·0
Vitamins—				
A (*I.U. per lb. of feed)	2,000	2,000	3,300	3,300
D_3 (*I.U. per lb. of feed) ..	180	180	450	450
B_2 (†mg. per lb. of feed)	1·6	0·9	0·9	1·3

* I.U. = international units.
† mg. = milligrams (1 milligram = ·001 grams; 28 grams = 1 oz. approx.)

If grain is being fed in conjunction with a mash, then the mash should contain extra protein, vitamins and minerals as the grain has a lower content of these nutrients. For instance, if the ration being fed consisted of two-thirds mash and one-third grain, then the mash should contain half as much again of vitamins and minerals, and extra protein to make the whole ration balance at the minimum requirements for the type of bird.

The availability of ingredients can be a big problem to the farmer mixing his own mash. As fowls do not take kindly to a change in ration it is wise to choose ingredients that are not so likely to become unobtainable. The most serious problems of unavailability are usually found with meat-and-bone meal, liver meal, and buttermilk powder. Unfortunately, meat-and-bone meal cannot be done without, unless more vegetable proteins become available (for example soybean meal). If shortages are going to be a big problem, then it is perhaps better to buy a prepared mash.

The cost of the ingredients is of course important. Feed is the biggest single item of expense on an established farm, so economy here can mean pounds saved. However, it is foolish to economise if the quality of the ration will suffer. Economies can be made by using more of the cheaper grains such as sorghum and white French millet (when available) and less of the expensive grains. Buttermilk powder, or liver meal, however, cannot readily be replaced by similar cheaper products.

When choosing the ingredients, a table of analysis of the available foodstuffs should be consulted:

Simple analyses such as shown in Table 2 can be misleading to the inexperienced person. It does not indicate that foodstuffs such as buttermilk powder, lucerne meal or liver meal are important because of the vitamin or mineral content. It must also be remembered that these values are only average values and the particular ingredient available could vary from the figure shown.

For practical purposes, the ration is usually balanced with regard to protein and fibre content and then mineral and vitamin supplements are added. This ensures that vitamins and minerals

TABLE 2

ANALYSIS OF COMMON QUEENSLAND POULTRY FOODSTUFFS

—	Minimum Crude Protein Per cent.	Minimum Crude Fat Per cent.	Maximum Crude Fibre Per cent.	Minimum Phosphoric Acid* (P_2O_5)	Minimum Lime* (CaO)
Wheat meal	12·0	1·5	5·0	..	..
Maize meal	10·0	5·0	5·0	..	..
Sorghum meal	10·0	2·5	2·5	..	..
Barley meal	11·0	1·0	6·0	..	..
Millet (Japanese)	10·0	4·5	8·5	..	..
Millet (white French)	12·0	1·5	6·0	..	..
Bran	14·0	2·0	11·0	..	..
Pollard	15·0	1·9	7·0	..	..
Lucerne meal (choice)	15·0	1·9	30·0	..	..
Lucerne meal (stemmy)	12·4	1·5	35·9	..	..
Wheat germ meal	27·0	10·0	2·0	..	..
Buttermilk powder	26·0	4·0	..	..	..
Dried whey powder	10·0	0·1	..	..	..
Coconut meal	20·0	5·0	12·0	..	..
Linseed oil meal	35·0	3·5	10·0	..	..
Meat-and-bone meal	55·0	8·0	..	6·0	7·0
Meat-and-bone meal	50·0	8·0	..	10·0	12·0
Meat-and-bone meal	40·0	10·0	..	15·0	18·0
Liver meal	65·0	12·0	..	2·27	0·65
Bone flour	20·0	..	..	25·0	30·0
Ground limestone	..	..	..	..	50·0

* Manufacturers are required by law to state on mash labels the minimum amounts of phosphoric acid (P_2O_5) and lime (CaO). This is the standard method of stating the phosphorus and calcium content of the product. To convert these figures to pure phosphorus and calcium, the phosphoric acid (P_2O_5) value should be multiplied by $^3/_7$ and the lime (CaO) value by $^5/_7$.

are present in definite amounts and does not introduce the inaccuracies that would occur by using average figures.

The proportion of the feedstuffs to be used in balancing the ration can be found only by trial and error. However, certain basic principles apply. Usually 70 to 80 per cent. of the ration will consist of crushed grains or a combination of crushed grains and mill offals. The remainder of the mash will consist of ingredients such as meat-and-bone meal and lucerne meal in laying rations, with the addition of liver meal and/or buttermilk powder when designed for breeding birds and chickens.

TABLE 3

CHICKEN RATIONS

—	Ration 1	Ration 2	*Ration 3	*Ration 4	Ration 5	Ration 6
Maize meal	30·0	25·0	25·0	30·0	20·0	..
Sorghum meal	45·0	28·0	25·0	43·0	20·0	16·0
Wheat meal	..	25·0	20·0	..	18·0	16·0
Bran	..	..	..	..	10·0	20·0
Pollard	..	..	..	..	10·0	30·0
Lucerne meal	3·0	3·0	3·0	3·0	3·0	3·0
Meat-and-bone meal (55%)	11·0	13·0	15·0	17·0	9·0	9·0
Liver meal	5·0	4·0	5·0	5·0	4·0	4·0
Buttermilk powder	4·0	..	5·0	..	4·0	..
Ground limestone	1·5	1·5	15·	1·5	1·5	1·5
Salt	0·5	0·5	0·5	0·5	0·5	0·5
†Added vitamin A	200,000 I.U.	200,000 I.U.	200,000 I.U.	200,000 I.U.	200,000 I.U.	200,000 I.U.
†Added vitamin D_3	18,000 I.U.	18,000 I.U.	18,000 I.U.	18,000 I.U.	18,000 I.U.	18,000 I.U.
†Added vitamin B_2	100 mg.	100 mg.	100 mg.	100 mg.	100 mg.	100 mg.
†Manganese sulphate	0·3 oz.	0·3 oz.	0·3 oz.	0·3 oz.	0·3 oz.	0·3 oz.
Total	100 lb.	100 lb.	100 lb.	100 lb.	100 lb.	100 lb.
Crude protein %	18·2	18·5	20·6	20·3	18·1	18·8
Crude fibre %	3·5	4·1	3·7	3·4	5·1	6·4

* Rations 3 and 4 are " broiler type " mashes.

† Per 100 lb. of mash.

Foods such as bran and lucerne meal should be restricted if a low fibre content is desired. Lucerne is seldom used at a higher rate than 5 per cent. It is important, however, to feed at least 3 per cent. lucerne because of its mineral and vitamin content, and in a laying ration, because it improves yolk colour.

Yolk colour should be given some consideration in every laying mash. Consumers object to pale-coloured yolks. For this reason both maize and lucerne are very desirable in a laying ration. When maize becomes expensive it can be reduced to 10 per cent. of the ration.

The rations shown in Table 3 have been formulated on the principle described. These rations show how different ingredients can be incorporated. If choosing one of these rations, then availability of ingredients and cost would be the major considerations. It should be noted that all these rations contain a 55 per cent. protein "meat-and-bone meal." If only lower protein content "meat-and-bone" meals are available, then more of these have to be added to balance the protein. This will add more calcium in the form of bone to the ration. The ration should therefore be balanced with respect to calcium by deleting some of the ground limestone. Overloading of the ration with calcium is likely to be detrimental, especially in chicken rations.

The calculations involved in balancing these rations are very simple. An example is shown in Table 4, where the protein content of this chicken mash has been balanced at 18·5 per

TABLE 3a

All-Mash Laying Rations and Breeding Rations

—	All-Mash Laying Rations				Breeding Rations	
	Ration 1	Ratiin 2	Ration 3	Ration 4	Ration 5	Ration 6
Maize meal	30·0	40·0	25·0	30·0	35·0	28·0
Sorghum meal	30·0	42·0	..	24·0	35·0	28·0
Wheat meal	25·0	..	22·0	..	12·0	..
Bran	..	..	15·0	10·0	..	10·0
Pollard	..	..	25·0	20·0	..	20·0
Lucerne meal	3·0	3·0	3·0	3·5	3·0	3·0
Meat-and-bone meal (55%)	5·0	12·0	4·0	10·0	5·0	5·0
Liver meal	4·5	..	3·5	..	4·0	3·5
Buttermilk powder	..	..	..	..	3·5	..
Ground limestone	2·0	2·0	2·0	2·0	2·0	2·0
Salt	0·5	0·5	0·5	0·5	0·5	0·5
*Added vitamin A	330,000 I.U.	330,000 I.U.	330,000 I.U.	330,000 I.U.	330,000 I.U.	330,000 I.U.
*Added vitamin D_3	45,000 I.U.	45,000 I.U.	45,000 I.U.	45,000 I.U.	45,000 I.U.	45,000 I.U.
*Added vitamin B_2	..	..	..	..	100 mg.	100 mg.
*Manganese sulphate	0·3 oz.	0·3 oz.	0·3 oz.	0·3 oz.	0·3 oz.	0·3 oz.
Total	100 lb.	100 lb.	100 lb.	100 lb.	100 lb.	100 lb.
Crude protein per cent.	15·1	15·2	15·9	15·8	15·1	15·4
Crdue fibre per cent.	4·4	3·9	6·6	5·6	4·1	5·5

* Per 100 lb. mash.

cent. The protein content of the ingredients has been taken from Table 2. The calculation involves finding the amount of protein each ingredient contributed to the 100 lb. of mash and the addition of these amounts gives the per cent. protein of the mash (that is, the amount of protein in 100 lb. of mash).

Just because the mash balances on paper it does not mean that it is a good mash. Some further points must be considered. The palatability of the ration is very important. This can be improved by making the feed of coarse texture rather than fine to the point of becoming a powder. If a ration contains a large percentage of pollard, then it is often found that the fowls will not eat the fine dust left in the trough.

Staleness of ingredients can also affect the efficiency of the ration. Staleness usually implies that the fats in the meal will have gone rancid, and in doing so may have destroyed the fat-soluble vitamins, such as vitamins A, D_3, E and K. It is for this reason that the added vitamins A and D_3 have been stabilised by the manufacturer. If some of the ingredients used have been stored for a long time, it may be advisable in chicken starting, broiler and breeding rations to add vitamins E and K to counteract the oxidising effect of rancidity in fat-soluble vitamins.

Over the past few years, much enthusiasm ha been shown by farmers for the so-called "hig energy" rations. These rations are compounded by reducing the amount of mill offals and more fibrous foods and using more crushed grains particularly maize and sorghum, in their stead. Such rations have a high energy content derived from the carbohydrates, starches and sugars in the grains, and a low fibre content. They are very efficient rations, for birds eat less feed to produce a dozen eggs or a pound of flesh than with rations containing higher amounts of fibre.

Even though shell grit is fed without restriction ground limestone should be incorporated in the mash to supply calcium for bone growth and shell formation. This is very important where large amounts of liver meal replace meat meal because liver meal contains very little calcium.

Seasonal Greetings are extended to all our readers and to those who have helped and co-operated with the work of the Department during 1960

TABLE 4

METHOD OF DETERMINING THE PROTEIN PERCENTAGE OF THE MASH

Ingredients	Crude Protein Analysis Per cent.	Lb. per 100 lb. Mash	Calculations	Amount Crude Protein
Maize meal	10·0	25	$\frac{25 \times 10}{100}$	2·5
Sorghum meal	10·0	25	$\frac{25 \times 10}{100}$	2·5
Wheat meal	12·0	25	$\frac{25 \times 12}{100}$	3·0
Lucerne meal	15·0	3	$\frac{3 \times 15}{100}$	0·45
Meat-and-bone meal	55·0	10	$\frac{10 \times 55}{100}$	5·5
Liver meal	65·0	5	$\frac{5 \times 65}{100}$	3·25
Buttermilk powder	26·0	5	$\frac{5 \times 26}{100}$	1·3
Ground limestone	..	1½	..	..
Salt	..	½	..	..
Vitamins	..	..	..	..
Total	..	100 lb.	Per cent. Protein ..	= 18·5%

Care should be taken when incorporating small amounts of ingredients such as vitamin supplements in the mash. These small amounts should be incorporated into a premix or mixed with 4 to 5 lb. of mash before being incorporated in the whole mix.

Salt, manganese sulphate and vitamin B_2 (riboflavin) are often incorporated into a premix consisting of 10 lb. salt, 6 oz. of manganese sulphate and 2 grams of synthetic riboflavin. A half pound of this premix is then added to every 100 lb. of mash. This ensures that the small amounts of manganese sulphate and vitamin B_2 become properly spread throughout the mash.

If desired, coccidiostats (drugs to prevent coccidiosis) and growth stimulants (antibiotics) can be incorporated in chicken feeds. These can be regarded purely as additives and do not interfere with the balancing of the ration.

Irrigated Pastures For Tableland Dairy Farms

By T. K. KELLY, and W. J. DRAPER, Agriculture Branch.

Irrigated pastures can be profitable on dairy farms on the Atherton Tableland. This has been demonstrated on Mr. J. Bravery's farm at Maunds Road near Atherton.

To justify the capital outlay and operating costs of an irrigation project there must be a profitable outlet for the produce and a need to increase output and efficiency. In this district as a result of an expansion of the northern milk market, an incentive payment is given by the Atherton Tableland Butter Association for milk produced between July 1 and November 30. The current incentive payment is 5d. a gal. which gives a total payment of 3s. 7d.

Need for Irrigation

Atherton has an average annual rainfall of 54 in., but about 60 per cent. of the rainfall is received in the first three months of the year. During the next quarter the rainfall usually consists of a succession of dull days with light misty rain. After this period, cool dry weather with occasional frosts is the normal pattern until temperatures rise in the spring. Rainfall is light from June until the storm rains of November and December.

Another factor which limits pasture growth during the winter, spring and early summer is the inability of the soil to store a satisfactory reserve of moisture from the abundant summer rainfall.

The Department of Agriculture and Stock arranged with Mr. Bravery to demonstrate the practicability of pasture irrigation on the Tableland. Consideration was given to the water supply, soil type, pasture species, fertilize requirements and management. The demonstration was established in early 1958.

Irrigation water has been drawn from Mazli Creek adjacent to the demonstration area. Th quality of the water is good and the suppl ample even in periods of drought.

The soil is typical of the maize growing be of the Tableland. Such soils are red in colo and have been derived from basalt. They a deep, well-structured clays, friable and permeabl and with a red-brown surface horizon changi to bright red in the deep subsoil. The perm ability and good drainage has much to recommen it for irrigation but a defect lies in the limite water holding capacity within the root zone the pastures. The main effect is that wate application needs to be frequent to avoid an setback of pasture growth.

Pasture Species

It was accepted that feed requirements coul best be met by using both tropical and temperat pasture species.

In February, 1958, two acres were sown t guinea grass and *Glycine javanica* and in Apr of the same year 3½ acres were sown to mixture of H1 ryegrass *Phalaris tuberosa,* cocksfoot and irrigation white clover. A furthe

2½ acres of temperate species consisting of H1 ryegrass, cocksfoot, *Phalaris tuberosa, Phalaris arundinacea* and irrigation white clover were sown in May, 1959.

The mixture of guinea grass and glycine was a proven combination under summer rainfall conditions in the district. With irrigation, growth has been prolonged through the autumn until frosts occur, usually in July. Following water application, growth again commenced in the spring.

The temperate species had not the same proven capacity in the district.

Since the project commenced, clover has given very good results. Of the grasses H1 rye grass has made excellent growth but is susceptible to rust. *Phalaris tuberosa* and *P. arundinacea,* while satisfactory, have lacked the vigour associated with these grasses in southern districts.

To test the performance of additional temperate species the original block was renovated in April, 1960, and oversown with Priebe's prairie, Clare subclover, and ladino white clover.

Both the tropical and temperate species have given a carrying capacity in excess of two dairy cows to the acre.

Fertilizer Requirements

The demonstration area had been continuously cropped with maize for about 40 years. As a result, fertility was low, and a green manure crop of cowpeas was ploughed in before the establishment of the pastures. Weeds are a major problem on the Tableland and a cropping programme designed to reduce weeds before the establishment of pastures would have been an advantage. A fertilizer mixture of equal parts of nitrogen and phosphoric acid (10:10:0) has been applied annually at the rate of 3 cwt. to the acre, with half the dressing in the spring and the remainder after the wet season.

Management

Mr. Bravery has paid careful attention to grazing practices which involve quick uniform grazing at intervals adjusted to the growth of the pasture and feed requirements. Strip grazing with an electric fence has been employed.

With the tropical species, cows have not been permitted to graze the pasture below a level of 12 in. This has permitted rapid regrowth and during the winter has reduced frost damage. Weeds have not been troublesome, as glycine has adequately filled the spaces between the clumps of guinea grass and tended to suppress young weed growth.

Careful management of the temperate species has been very necessary to maintain a balance between clover and grasses and to control weeds.

As hot dry periods can occur during the early summer months, grazing has been regulated during such periods to maintain a minimum of 3 in. of ground cover.

This is necessary to keep soil temperatures at a sufficiently low level for the survival of the temperate species. To prevent wilting during hot weather, a watering of 1 to 1½ in. was required every 10 days. With the guinea grass and glycine, watering has been less frequent but applications heavier.

Costs

The following costs *per acre* have been based on an application of 20 in. of water a year.

——	Tropical Species	Temperature Species
	£ *s.* *d.*	£ *s.* *d.*
Pumping (electric motor) . .	4 0 0	4 0 0
Fertilizer	3 15 0	3 15 0
Depreciation	6 13 0	6 13 0
Interest	3 5 0	3 5 0
Labour (Moving pipes) . .	2 16 3	5 12 6
Labour (Electric fence and spreading fertilizer) . .	3 0 0	3 0 0
Mowing or slashing	. .	0 10 0
Total	£23 9 3	£26 15 6

In terms of milk production the costs are not high. For the temperate species the production of 178 gal. an acre a year would cover costs with a net return of 3s. a gal. for milk. This is equivalent to about ½ gal. daily per acre. In the case of guinea grass and glycine it would be slightly less. For the total irrigated area of 8 acres it would be necessary to produce 4 gal. extra a day to cover costs.

As 5 acres of lucerne have recently been established adjacent to the demonstration, some costs in future could be charged against the lucerne.

Milk Production and Composition

Mr. Bravery did not supply milk before 1958, but is firmly convinced that irrigated pastures are profitable on his farm and preferable to the alternative of conserving silage and buying concentrates.

Apart from an increase in production, the maintenance of milk composition has been an advantage associated with the irrigated pastures.

On many dairy farms on the Tableland there is a seasonal decline in milk composition associated with a fall in the nutritive value of pastures. As a result many dairy farmers have difficulty supplying milk late in the year above the legal minimum of 3·3 per cent. fat.

To Sum Up:

(*a*) Irrigated pastures can overcome both a seasonal decline in milk production and composition on the Atherton Tableland and be profitable to the dairyfarmer.

(*b*) All dairy farms in this district are not suitable for irrigation but a number have the necessary facilities.

(*c*) A spray irrigation system is best suited to a 2-man dairy farm.

(*d*) A cropping programme to increase fertility and reduce weeds is a desirable prerequisite before establishing pastures on the Atherton Tableland.

(*e*) Good management is of vital importance, particularly with reference to the maintenance of temperate pasture species.

Germinating Lettuce in Summer

Faulty germination of lettuce in hot weather is a major summer problem for growers.

Germination failures are due to the peculiar effect of temperature on lettuce seed. In cool weather, at 60 to 70 deg. F., the seed germinates freely, provided it is matured and has been held under dry and cool conditions.

Higher temperatures reduce germination ability. At and above 86 deg. the seed tends to go into dormancy and germination may be almost completely stopped. No wonder, then, that growers often record poor strikes in summer when the surface soil may be as hot as 100 deg. and more.

Seed for summer crops should preferably be packed in air-tight jars and held between 50 and 60 deg. If the seed has experienced long exposure to excessive heat, it should be soaked in water for 2 hours, then strained and held in storage at 40 deg. for 4 to 6 days. This treatment will break any dormancy, but the seed must be sown at once—it cannot be stored.

As an alternative, soaking the seed for 10 hours in a 0·5 per cent. solution of thiourea at 65 to 70 deg. is worth a trial. Thiourea is a chemical dormancy breaker, and treated seed may either be sown immediately or held for later plantings.—*D. DOWDLES, Adviser in Horticulture.*

pasture and crop

Barley Quality.—The highest quality malting barley is produced when the growing period is long and uniform, such as in the temperate regions. Climates which are warmer and drier shorten the growing period, resulting in the formation of a harder, higher protein grain. These shortened conditions apply to this State, but fortunately our soil fertility is high enough to produce good high protein grain, suitable for the milling industry. On the less fertile soils, reasonably good malting barley is produced.

At the Hermitage Regional Exepriment Station this year a Time of Planting trial is being conducted using the variety Prior. The first sowing commenced in March and from then onwards, monthly plantings, concluding in July. From this trial, protein, malting quality, yield, bushel weight, and the weight of 1,000 kernels will be determined.

In conjunction with the Barley Board, a grower survey for malting barley has just concluded. About 180 growers participated in this survey, which was carried out in a similar manner to that of last season and reported in this Journal. The information is proving to be of considerable value to the Board in disposing of the crop in the most favourable manner. Any grower desiring a report on the quality of the barley he is producing should contract the Agricultural Chemist.

—*W. J. T. KELSO, Senior Cereal Chemist.*

Experimental Work on the Downs.—In commenting on some of our Agriculture branch's activities on the Darling Downs, I must leave no doubt on two points, firstly, that this work is not associated with the research programme of our Science Branch (in fact it is quite minor when compared with the work of these specialists). And secondly, in dealing with experimental programme, though able to mention interesting trends, I am of course, quite unable to arrive at conclusions or to forecast results at this stage.

Nevertheless, it is interesting to know what is going on. Take wheat for example; we are doing all sorts of things, but one of our main lines is sorting out the potential new varieties in the material supplied to us by our plant breeders. In this territory we have four varietal trials, one at Jondaryan, one at Meandarra and two (an early and a late trial) at Wandoan. Apart from some completely new material supplied by David Rosser, the main interest in this series of trials lies in the comparative performance of Gala—that's the Lawrence x Gabo hybrid—and Mengavi, the much publicised N.S.W. variety, with that of our standard varieties. Gala, of course, has performed particularly well in past trials and Mengavi which has never previously been subjected to comparative tests in Queensland has a big reputation to live up to. By the end of the season we should be able to give you a fairly reliable assessment of the capabilities of both varieties.

With barley we are doing similar varietal testing and here prime interest is focused on the new South Australian barley release Noyep—Noyep by the way is the abbreviation for Noyes Early Prior—Noyep looks particularly attractive and along with Maltworthy and Research should provide our standard Prior with some good competition.

Our oat grazing trials have now been extended to include comparison with grazing crops like Cape Barley, black barley, canary seed, crops like ryecorn as it is popularly called and dual purpose wheats, and winter wheats such as Winglen. Benton, that fast, beautiful oat looks as though it may take some tossing but it is yet too early to pass judgment especially as during the cold weather rye, black barley and Winglen all came into their own. But here again are trials which should add to our information on the grazing productivity of our various winter crops.

The glamour work of the season of course is our wild oat control work. For years now we have been saying—without much conviction or hope I must confess—"some day we'll get something to control wild oats" and it looks as though we really might have it now. Now, on no account do I want to raise any false hopes—there is a long way to go yet—but in a series of trials in which we have actually sown wild oats with other winter crops we are indeed getting promising results. We are testing two types of weedicides, a post-emergence and a pre-emergence and you can take it for granted that you will soon hear plenty about our results.

With linseed, too, we are doing quite a lot of work, especially in relation to the nutritional disorder so prevalent on our open downs country. Though I think that on this season's results we can say that we can largely correct this disorder by the application of certain mineral elements there is a considerable amount of work yet to be done in relating results to commercial applications. We rate this work highly for we feel that crops other than linseed may also respond to the corrective treatment.

—*J. HART, Senior Adviser in Agriculture.*

◆

This Half-Bred Quarter Horse, Seen at "Risdon," near Warwick, is 2½ years old "Bomber," Bred from a Thoroughbred Quarter Horse Stallion and an Australian Mare. These horses are specially bred for arduous cattle drafting, outstanding speed, show performance and temperament.

Wheat Grain Composition And Soil Fertility

By W. T. KELSO, Senior Cereal Chemist.

A very wide range exists in the available phosphate content of the wheat-producing soils in this State. Expressed in terms of the amount present in 1 acre of soil, 1 ft. deep, this would range from 6,000 lb. to 150 lb. In the case of total soil nitrogen, the range is much narrower, that is, from 3,000 lb. to 1,800 lb.

Wheat grown in these soils can vary from 1.2 per cent. phosphate to 0.4 per cent. phosphate and so the content is much less variable than the soils.

Wheat protein (which is nitrogen multiplied by 5.7) varies from 17 to 8.5 per cent. and this range closely follows the nitrogen content range in the soil. Associated with protein content is the number of bushels harvested. As a general rule, it can be stated that for any one untreated soil growing the same variety, an increase in yield reduces the protein content and vice versa. This assumes that the crop has not suffered from disease, hail or frost. Variations in yield result from changing climatic conditions.

TABLE 1

Soil Nitrogen (Total)	Soil Phosphate (Available)	Grain Protein	Grain Phosphate	Yield
low ..	high	low	high	low
high ..	low	medium high to high	low	high
low ..	low	low	low	low
high ..	high	high	high	high

TABLE 2

District	% Phosphate 1958 with range	% Phosphate 1959 with range	Protein %	
			1958	1959
Peak Downs	·58 (·71 to ·39)	·57 (·71 to ·48)	12·1	12·5
Callide	·83 (1·03 to ·44)	·85 (·98 to ·64)	14·2	13·6
Far Western 1	·69 (·97 to ·51)	·67 (1·01 to ·50)	13·7	13·8
Far Western 2	·77 (·93 to ·53)	*	14·2	*
Far Western 3	·53 (·66 to ·41)	·46 (·50 to ·43)	12·4	11·4
Warwick	·91 (1·19 to ·59)	·81 (·90 to ·64)	11·9	12·4
Burnett	·60 (·85 to ·33)	·66 (·86 to ·44)	11·1	11·3
Pittsworth	·77 (·97 to ·48)	·69 (1·03 to ·41)	12·0	12·2
Jondaryan	·84 (1·06 to ·57)	·78 (·99 to ·43)	12·5	12·9
Millmerran	·85 (1·19 to ·61)	·73 (·95 to ·48)	13·3	13·0
Meandarra	·61 (·70 to ·49)	·71 (·94 to ·66)	12·3	14·7
Jandowae	·78 (1·02 to ·61)	·76 (1·10 to ·49)	12·0	12·6
Cecil Plains	·76 (·87 to ·55)	·78 (1·02 to ·51)	12·0	12·5
Dalby	·81 (·97 to ·54)	·56 (·73 to ·41)	12·5	12·7
Clifton	*	·85 (1·03 to ·58)	*	12·5

*Number of samples was too small.

Far Western 1 is Warra, Brigalow, Chinchilla.

Far Western 2 is Miles, Dulacca, Jackson.

Far Western 3 is Roma, Wallumbilla.

Protein and grain phosphate are inter-related and there is a limit to the highest and lowest amounts which the grain can contain. Therefore if you have soils varying in nitrogen and phosphate, various combinations of grain composition can be expected to follow the pattern in Table 1.

For the 1958 and 1959 seasons, grain phosphate studies were commenced, in association with the normal protein surveys.

Table 2 sets out the average values, obtained on a district classification. The results are reported on a 13.5 per cent. moisture basis. It will be noted that in any one district the range of values is quite marked, and in many instances would be due to the district classification used. The phosphate level in general is high with the exception of Peak Downs, Far Western 3, Burnett, Meandarra and possibly Far Western 1.

Commencing this season, work on this survey will be continued for a further 5 years when samples will be analysed on a parish classification. It is anticipated that a useful map can be drawn showing soil fertility in relation to grain composition.

Mossman Burr And Sand Burr

For a long time Mossman burr* or Mossman River grass has been a troublesome weed in coastal districts and in some other tropical areas. More recently sand burr†, a similar grass, has appeared in several places in southern Queensland.

Both Mossman burr and sand burr are tufted grasses with fairly broad green leaves and an attractive appearance when young. Both have compact spikes of prickly, burry "seeds". Mossman burr grows in dense clumps with bunches of upright stems and the seed head is 2 to 4 in. long; sand burr is usually in rather flattened clumps with the stems spread and the seed heads short and with few burrs. Differences in the "seeds" themselves are shown in the drawings.

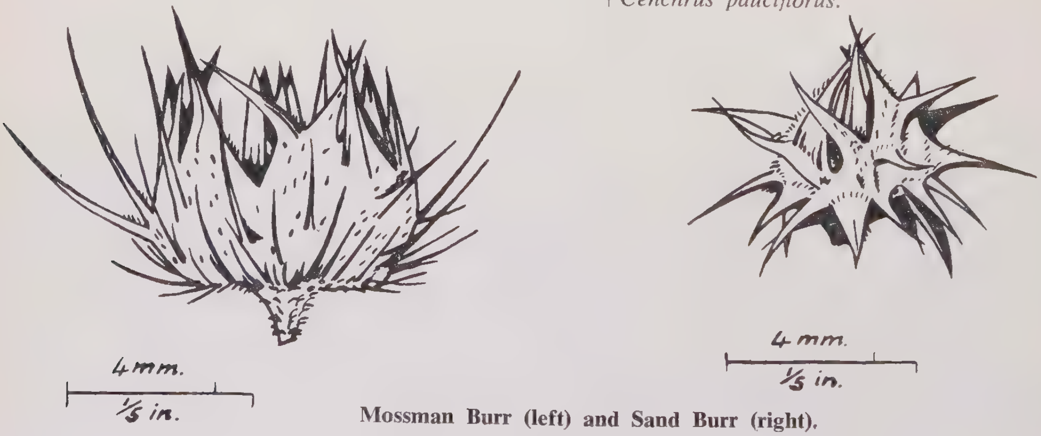
Mossman burr is very abundant near the coast from the southern border northwards. It is a troublesome pest along the coastline, particularly on bathing beaches and in recreational areas, where the sharp burrs stick to clothing and get in the feet of bathers. It is also a common weed of maize, tobacco and peanuts. As yet sand burr is not widespread in Queensland. It has been found in the south-eastern part of the State, particularly on the southern Darling Downs, but it could spread into sheep raising areas and would be a serious pest in wool. It grows on sandy soils, mainly along roadsides and in silty gullies.

Ordinary hormone weedkillers are not effective against either of these plants but both can be killed with grass-killers such as TCA, sodium chlorate and dalapon. Spraying with diesel distillate or power kerosene will also kill them if they are young. For recreational areas such as seaside resorts and picnic areas, regular close mowing is the best method of control. In crops, thorough preparation of the land helps to reduce the numbers of burr plants. Several chemicals show promise for pre-emergence weeding of maize but these need further testing before definite recommendations can be made. The important things are to recognise the plants and to attack them while they are still young and fresh and before the burrs are fully developed.

—*S. L. EVERIST, Government Botanist.*

* *Cenchrus echinatus.*

† *Cenchrus pauciflorus.*


4mm.
1/5 in.
4mm.
1/5 in.

Mossman Burr (left) and Sand Burr (right).

Dairy Yields Up In Dry Year

By W. R. SIGLEY, Dairy Officer, Allora.

The results of herd recording in the Allora and Ascot districts show how farmers are going a long way towards offsetting dry conditions by better farm management.

In the 1956-57 herd recording year, 21 herds were recorded. The herd average for the year was 4,619 lb. of milk and 194 lb. of butterfat. The length of lactation for the 19 herds was 234 days; 1956-57 was classed as an average season.

In the herd recording year 1958-59, which was a very dry year, 33 herds were recorded. The herd average was 5,159 lb. of milk, 210 lb. of butterfat and the average lactation period was 249 days.

The year 1958-59 was one of the driest on record. Yet the herds bettered their 1956-57 average by 540 lb. of milk and 16 lb. of butterfat. In addition, the cows milked for 15 days more than they did in the year recording was commemnced.

The increased production and length of lactation can be attributed to better farm management.

In the first place, there has been a marked increase in the amount of silage conserved. One farm in the Clifton district has 300 tons of silage underground, while several others have 50 tons or over. Much of this was fed out during the drought of 1958-59.

Grain Feeding

There has also been an increase in the amount of hay conserved on the farms. But the most spectacular feature has been the advance in grain feeding. Most farmers conserve sufficient grain on the farm to enable them to feed the cows a daily ration. If the season is dry, as it was in 1958-59, the grain is fed in conjunction with hay or silage.

Several dairy farmers have installed silos as a means of preventing rodent damage to grain. Others have built mouse-proof barns.

A ration of grain and hay or silage, all grown on the farm, has been mainly responsible for the higher production figures, despite the severe season.

Longer Lactation

Herd recording has also been responsible for directing attention to culling and the use of pure bred bulls. The information which herd recording gives the farmer enables him to cull on a sound basis without recourse to guesswork. The main reasons for culling so far have been low production and short lactation. The number of cows culled for disease or bad temperament has been far fewer by comparison. The effects of culling, combined with a better feeding programme, are reflected not only in the higher production, but in the extra number of days in the lactation period.

There has been an increased demand for pure bred bulls from high-producing cows as a result of the interest created by herd recording in this district. Farmers are turning more and more to bulls of tried blood to build up their herds.

There is also an increased interest in better calf management. More and more calves are now being fed grain and hay, to give them a sound start after weaning. These calves are growing into sturdier animals than their predecessors, who had to fend for themselves in the paddock once they were turned off the bucket.

Although 1959-60 has not been a favourable year for the dairy farmer, it is expected that the herd recording results when completed will show averages for this area as good as if not better than those of 1958-59.

Brucellosis-Tested Swine Herds (As at 30th November, 1960)

Berkshire

Bernoth, B., Wyreema
Clarke, E. J., "Kaloon", Mt. Alford, via Boonah
Cochrane, S., "Stanroy", Felton
Cook, F. R. J., "Astonvilla", Middle Creek, Pomona
Crawley, R. A., Rockthorpe, Linthorpe
Edwards, C. E., "Spring Valley" Stud, Kingaroy
Farm Home For Boys, Westbrook
Fletcher, A. C., "Myola" Stud, Jimbour
French, A., "Wilson Park", Pittsworth
H. M. State Farm, Numinbah
H. M. State Farm, "Palen" Stud, Palen Creek
Handley, J. L., "Meadow Vale", Lockyer
Handley, G. R., "Locklyn" Stud, Lockyer
James, I. M. (Mrs.), "Kenmore" Stud, Cambooya
Kath, E. E., "Topcamp", via Toowoomba
Kimber, E. R., Block 11, Mundubbera
Law, D. T., "Rossvill" Stud, Aspley
Lees, J. C., "Bridge View" Stud, Yandina
Ludwig & Sons, A. R., "Beau View" Stud, Beaudesert
O'Brien & Hickey, J., "Kildurham" Stud, Jandowae East
Orange, L. P., "Eula", Flagstone Creek
Pfrunder, P. L., Pozieres
Potter, A. J., Ascot, via Greenmount
Q.A.H.S. & College, Lawes
Regional Experimental Station, Hermitage
Rosenberger, N., "Nevrose", Wyreema
Rosenblatt, G., Rosevilla, Biloela
Schellback, B. A., "Redvilla" Stud, Kingaroy
Smyth, E. F., "Grandmere" Stud, Manyung, Murgon
Stark, H. L., "Florida" Stud, Kalbar
Traves, G., "Wynwood" Stud, Oakey
Weier, V. F., "La Crescent", Clifton
Young (Jnr.), W., Kybong, via Gympie

Large White

Assenbruck, C., Mundubbera
Barron Bros., "Chiltern Hill", Cooyar
Bell & Son, E. J., "Dorne", Chinchilla
Behm, A. M., "Aleun", Wondai
Butcher, Dr. B. J. & Parnwell, A. J. Plunkett Rd., via Tamborine
Clark, L. D., Greens Creek, Gympie
Coller, R. H., "Relloc", Tallegalla, via Rosewood
Cook, F. R. J., "Astonvilla", Middle Creek, Pomona
Dower, R. J. & E, A., "Dowlea", Tingoora
Duncan, C. P., "Colley", Flagstone Creek
Fowler, S., "Kenstan", Pittsworth
Franke, H. J. and Son, "Delvue" Stud, Cawdor
Garrawin Stud Farm Pty. Ltd., Samford
Gibbons, A. E. H., Mt. Glorious
Gibson, H., "Thistleton" Stud, Maleny
H. M. State Farm, Numinbah
Hall, M., "Milena" Stud, D'Aguilar
Heading, J. A., "Highfields", Murgon
Hickson, K. L., "Warra", Calliope
Hoey, T. W. & S. J., Mirridong Farm, Upper Forest Springs, MS74 Clifton
Horton, C. J., "Mannuem Brae" Stud, Mannuem, Kingaroy
Hutton, G., "Grajea" Stud, Toowoomba
Jones, K. B., "Cefn" Stud, Clifton
Kahler, J. & S., "Karajoy", East Nanango
Kanowski, A., "Exton", Pechey
Kennard, R. B., "Collar" Stud, Warwick
Larsen, H. L., "Oakway" Stud, Kingaroy
Law, D. T., "Rossvill" Stud, Aspley
Lees, J. C., "Bridge View", Yandina
Lobegeiger, L. C., "Bremer Valley" Stud, Moorang, via Rosewood
Mack, A. J., Mundubbera
"Marcliff" Stud, Wecker Rd., Mt. Gravatt
Neilsen, L. R., "Sunny Hill," Ascot, via Greenmount
Neilsen, A. R., Ascot, via Greenmount
Palmer, V. P. & Son, "Remlap", Greenmount
Port Curtis Co-operative Dairy Association Ltd., Stud Piggery, Biloela
Postle, R., "Yaralla" Stud, Pittsworth
Potter, N. R., "Actonvale", Wellcamp
Powell, R. S., "Kybong", Gympie
Q.A.H.S. & College, Lawes
Radel, V. V., Coalstoun Lakes
Radel, R. M., "Turua", Coalstoun Lakes
Regional Experiment Station, Biloela
Regional Experiment Station, Kairi
Robinson, O. R. & O. J., "Linvale", Argoon, Biloela
Rosenblatt, G., Rosevilla, Biloela
Skyring, G. I., "Bellwood" Stud, via Goomeri
Stanton, H. R., "Lanherne" Stud, Tansey, via Pomona
Stehn, L. W., "Hodgson Vale", via Toowoomba
Stewart, L., "Ban-Nookoo", Mulgowie, via Laidley
Stumer, K. F., French's Creek, Boonah
Thomas & Sons, "Rosevale", Laravale
Wharton, C. A., "Central Burnett" Stud, Gayndah
Wieland, L. C. & E., Lower Cressbrook, Toogoolawah
Zahnow, W., Rosevale, via Rosewood

Tamworth

Armstrong, H. J., "Alhambra", Crownthorpe, Murgon
Booth, J. D., Swan Creek, Warwick
Campbell, P. V., "Lawnhill" Stud, Lamington
Fletcher, A. C., "Myola" Stud, Jimbour
Herbst, L., "Hillbanside", Bahr Scrub, Beenleigh
Kanowski, S. E., "Miecho", Pinelands
Potter, N. R., "Actonvale" Stud, Wellcamp
Regional Experimental Station, Kairi
Salvation Army Training Home For Boys, "Canaan" Stud, Riverview
Stephen, T., "Withcott" Stud, Helidon
Wieland, L. C. & E., Lower Cressbrook, Toogoolawah

Wessex Saddleback

Ashwell, J., "Green Hill", Felton South
Cooper, G. J., Neumgua
Douglas, W., "Greylight" Stud, Goombungee
Dunlop, J. B., "Kunawyn", Acacia Rd., Kuraby
Kingsford, D., "San Antone", Toowoomba
Kruger & Sons, "Greyhurst" Stud, Goombungee
Lau, D. E., "Homevale", Goombungee
Law, D. T., "Rossvill" Stud, Aspley
Mack, A. J., Mundubbera
Scott, A., "Wanstead", Grantham
Smith, C. R., "Belton Park", Nara

Landrace

Ashwell, J., "Greenhill", Felton South
Behm, A. M., "Aleun", Wondai
Crawford, G. L., "Glenvillan", Manneum
Crothers, B. M., "Booligar", Clifton
Dower, R. J. & E. A., "Dowlea", Tingoora
Duncan, C. P., "Colley", Flagstone Creek
Fowler, K. P., "Northlea", Coalstoun Lakes
Franke, H. J. & Son, "Delvue", Cawdor
Garrawin Stud Farm Pty. Ltd., Samford
Grayson, D. G., Killarney
Itzstein, R. A., "Hyde Park", Gooroolba, Gayndah Line
Jensen, A. P., & Grace, V. S., Theodore
Jones, K. B., "Cefn", Clifton
Kajewski, W. & Son, "Glenroy", Glencoe
Kath, E. E., "Topcamp", via Toowoomba
Kingsford, D., "San Antone", Toowoomba
Law, D. J., Rossville Stud, Aspley
Lusk, P. B. and I., Westbrook
"Marcliff" Stud, Wecker Rd., Mt. Gravatt
Neilsen, A. R., Ascot, via Greenmount
Neilsen, L. R., "Sunny Hill", Ascot, via Greenmount
Orange, L. P., "Eula", Flagstone Creek
Palmer, V. P. & Son, "Remlap", Greenmount
Powell, R. S., "Kybong", Gympie
Radel, R. M. "Turua", Coalstoun Lakes
Semgreen, A. L. & D. J., "Tecoma", Kingaroy
Stehn, L. W., "Hodgson Vale", via Toowoomba
Stummer, K. F., French's Creek, Boonah

Large Black

Pointon, E., Goomburra

Plate 13

Maned Goose, *Chenonetta jubata* Latham, **Near Dyer's Swamp, Laidley.**

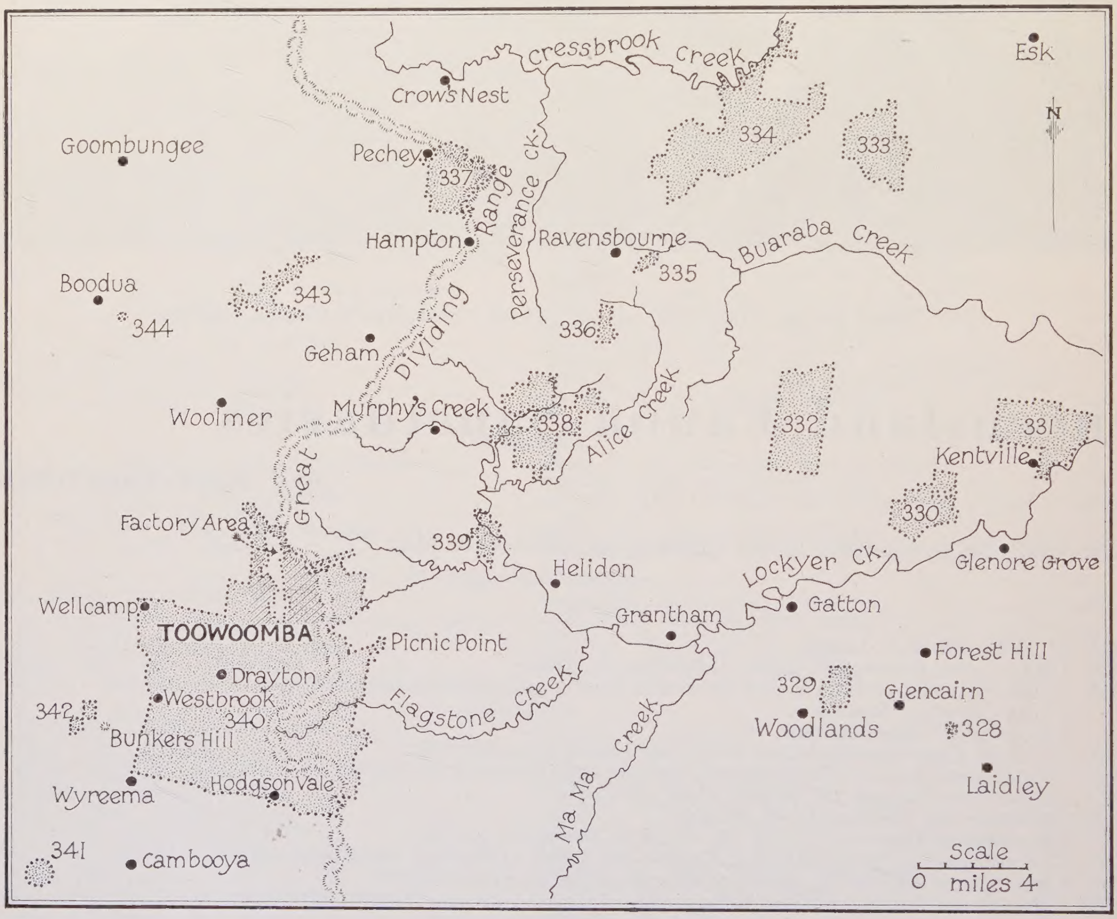
Queensland Fauna Sanctuaries

By C. ROFF, Fauna Officer.

The following is an index of the Sanctuaries outlined in Map 25:

Index No.	Sanctuary	Area in Acres
328	" Dyer's Swamp," Laidley	96
329	State Forest Reserve 667, parish of Gatton, via Gatton	1,023
330	Lake Clarendon, Pasturage and Recreation Reserve and adjoining area	1,292
	Lake Clarendon Sanctuary	735
	Property at Lake Clarendon	472
331	Lockyer Creek area (Including Seven Mile Lagoon), via Kentville	4,800
332	State Forest Reserve 573, parishes of Lockyer and Clarendon, via Gatton	6,854
333	State Forest Reserve 531, parish of Esk, via Esk	3,234
334	Property near Redbank Creek, via Esk	374
	State Forest Reserves 527, 528, 529, parish of Deongwar, via Esk	10,279
335	" Ravensbourne ", National Park Reserve 492, Parish of Buaraba, via Ravensbourne	224
336	State Forest Reserve 575, parish of Ravensbourne, via Ravensbourne	604
337	State Forest Reserves 509 and 909, parishes of Crow's Nest and Douglas, via Pechey	2,878
338	State Forest Reserve 564, parish of Murphy, via Murphy's Creek	5,060
339	" Springbrook ", Lockyer, via Helidon	766
340	Residential District of City of Toowoomba	
	Drayton Shire	
	Wetalla Sewerage Treatment Works, Toowoomba	

	Willowburn Hospital, Toowoomba	46,670
	Horn Park, Toowoomba	
	Rifle Range, Toowoomba	
	One Tree Hill Reserve, Toowoomba	
	Property near Withcott	
	Jubilee Park, Toowoomba	
	Picnic Point, Toowoomba	
	Weetwood, Toowoomba	
	Clifford Park Racecourse, Toowoomba	
	Hartman's Gardens, Toowoomba	
	Middle Ridge Golf Links, Toowoomba	
	"Smithfield," Drayton	
	"Southdown," Drayton	
	Property near Drayton	
	Redwood Park, Toowoomba	
341	Portion of Harrow Station, Cambooya	1,690
342	Experimental Farm Reserve, Westbrook	428
343	Cooby Creek Dam, Toowoomba	1,393
344	Cooby Creek Reserve, via Boodua	16


Cressbrook Creek
Esk
Crow's Nest
N
Goombungee
Pechey
337
Range
Perseverance Ck.
334
333
Hampton
Ravensbourne
335
Buaraba Creek
Boodua
343
344
336
Geham
Dividing
Woolmer
Murphy's Creek
338
Alice Creek
332
331
Kentville
Great
Factory Area
339
330
Helidon
Glenore Grove
Lockyer Ck.
Wellcamp
Gatton
TOOWOOMBA
Grantham
Picnic Point
Forest Hill
Drayton
Westbrook
329
Glencairn
342
340
Flagstone Creek
Woodlands
328
Bunkers Hill
Ma Ma Creek
Laidley
Wyreema
Hodgson Vale
341
Cambooya
Scale
0 miles 4

Map 25: **Map showing Sanctuaries in Part of Fauna District No. 1.** The sanctuary boundaries, as at December 31, 1957, are delineated by dotted lines enclosing the stippled areas.

VOL. 86 JANUARY-DECEMBER, 1960 PARTS 1 TO 12

Queensland Agricultural Journal

INDEX

Page

A

- Accident Prevention 391–395
- Aircraft for Graziers 721–725
- Animal Research Institute Jubilee .. 169–171
- Apples—
  - Pest Control in Granite Belt .. 102–107
  - Pollination 451–454

B

- Balanced Farming 2–4
- Bananas—
  - Desuckering 55–57
  - Spikeleaf 283–285
- Barley Production 33–40
- Beans—
  - Castor 225–227
- Beef Cattle—
  - Anaplasmosis 110–112
  - Breeding Guide 421–422
  - Cattle Husbandry Branch Operations 228–231
  - Crossbred Steers Versus Purebreds.. 731–733
  - Feeding .. 5–12, 73–75, 145–148, 745–757
  - Foot-rot 357–359
  - Grain Fattening 337–341
  - Mycotic Dermatitis 383–385
  - Yards 212–218
- Beekeeping—
  - Honeycomb Removal 191–193
  - Legislation 127–131

C

- Castor Bean Production 225–227
- Cheese—
  - New Types 563–569
- Citrus—
  - Young Tree Care 379–382
- Concrete Floors 61–62
- Cotton Growing 407–417, 484–494
- Cowpeas 303–308, 673–676

Page

D

- Dairying—
  - Anaplasmosis 110–112
  - Atherton Tableland Production .. 195–200
  - Calf Rearing 342–350, 555–559
  - Cattle Husbandry Branch Operations 228–231
  - Closed Herd 209–211
  - Foot-rot 357–359
  - Herd Recording 113–116, 174–178, 291–292, 437, 533–534, 741–744
  - Hot Water System 434–436
  - Increasing Production 235–236, 599–602, 681–683
  - Management 467–472
  - Milk and Cream Transport .. 13–17, 501–505
  - Milk Contamination 643–645
  - Milking Machine Buying 280–282
  - Milking Machine Cleaning 161–168
  - Milk Taints 364–369
  - Mycotic Dermatitis 383–385
  - Paspalum Ergot Poisoning 370–371
  - Refrigerator for Milk or Cream .. 41–44
  - Silage Feeding 779
  - Water Storage 255–258
- Disease Prevention 47–49, 108–109, 187–190, 209–211

E

- Entomology—
  - Heliothis Moths 219–221
  - Nematodes 386–388, 495–496
  - Tobacco Pest Control 423–424

F

- Farm Economics 251–253, 277–279
- Farm First Aid 439–446
- Fauna—
  - Conservation 323–330, 360–362
  - Sanctuaries 58–60, 119–121, 261–263, 521–522, 585–586, 781–782

Fodder Conservation— Page
Silage making 295–300
Fruit Quality and Maturity .. 315–318, 374–377
Furniture Renovation 138–140

G

Goats—
Breeding, Feeding and Management 611–622, 697–703, 720
Grain Storage 551–554
Grapes—
Vine Propagation 99–101

H

Horses—
Tetanus Prevention 431–433

I

Irrigation 726–730

L

Linseed—
Heliothis Control 219–221

M

Maize—
Hybrid Varieties 158–160
Trials at Kairi 531–532
Mango Production 761–766
Minister's New Year Message 1

P

Pastures—
Burnett District 745–757
Elephant Grass 759–760
Glycine .. 425–427, 507–513, 677–680
Irrigated 245–250, 354–356, 465–466, 772–774
Legumes 273–275
Makarikari Grass 420
Production Costs 657–658
Sorghum 145–148
Pears—
Pest Control in Granite Belt 102–107
Pigs—
Abortions and Stillbirths 50–54
Ear Notching 91–94
Feeding 180, 605
Lice Eradication 573
Pens 663–665
Pneumonia 734–738

Pineapples— Pag
Crookneck 97–9
Fertilizers 473–477
Nematode Control 386–38
Research 635–64
Weed Control 181–18
Poison Plants—
Yellowberry 172–17
Poison Precautions 27
Poultry—
Chicken Losses 84–90, 17
Chickens to New Guinea by Air .. 319–32
Coccidiosis 477–479, 667–67
Duckling Losses 36
Egg Quality 237–239, 481–48
Fast Feathering 286–29
Management .. 241–242, 607–609, 767–77
Nicarbazin 16
Septicæmic Cholera 29–3
Primary Production 1958–59 122–12

Q

Queensland's Rural Industries .. 707–71

R

Recipes 63–65, 135–137, 265–269, 650–652, 716–71

S

Scrub Tick 28
Seed—
Canary 597–598
Cowpeas 303–308
Sheep—
Fat Lambs on Darling Downs .. 19–2
Grain Poisoning 76–7
Mules Operation 149–15
Pet Lamb Feeding 739–74
Tetanus Prevention 431–43
Soil—
Conservation 23–26, 659–66
Sorghum—
Hybrid Varieties 593–59
Soybean Production 153–15
Strawberries—
Fruit Rots 311–31
Production 687–69

T

Tobacco—
Pest Control 423–424
Tomatoes—
Disease Control 535–549, 625–63
Tractor Testing 517–520, 577–584

W

Wheat—
Grain Composition and Soil Fertility 777–778